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# **THE NATIONAL SHIPBUILDING RESEARCH PROGRAM**

## **Methodology of Part Standardization**

U.S. DEPARTMENT OF THE NAVY  
CARDEROCK DIVISION,  
NAVAL SURFACE WARFARE CENTER

in cooperation with  
Newport News Shipbuilding

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# **METHODOLOGY OF PART STANDARDIZATION**

**Final Report  
September 27, 2000**

**Deliverable under NSRP Project 6-98-2  
Administrated by Maritech ASE**

Submitted by  
**Bath Iron Works**  
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# **PROJECT APPROACH OUTLINE**

**PHASE I**    Establish Part Standardization Methodology  
Approach

**PHASE II**    Implement Part Standardization Methodology

**PHASE III**    Deploy Methodology

**NATIONAL SHIPBUILDING RESEARCH**  
**PROGRAM PROJECT**  
**6-98-2**

**PHASE I**

**ESTABLISHING PART STANDARDIZATION**  
**METHODOLOGY APPROACH**

PHASE I  
ESTABLISHING PART STANDARDIZATION METHODOLOGY  
APPROACH

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# PHASE I ESTABLISHING PART STANDARDIZATION METHODOLOGY APPROACH

## **Introduction:**

The purpose of this document is to introduce the basic requirements for the design and implementation of a Part Standardization Program within the shipbuilding and marine design communities. The adoption and use of a Part Standardization Program within these industries will be instrumental in reducing design and materials costs across shipbuilding programs and reducing overall Life Cycle and support services costs for the life of the end products affected. Properly supported and implemented Part Standardization efforts can result in some, or all, of the following benefits:

- Establishes and maintains one central point of origin and management controls for material changes, specification anomalies, vendor competition issues, and a myriad of other internal and external change activities which have impacts to material definition requisitioning and supply. Part Standardization enables companies to put forth a structured approach and focus on complex and traditionally expensive processes.
- Significant cost avoidance in the areas of material handling, administration, warehousing, receipt inspection and documentation of one time or minimum quantity procurements. Part Standardization provides the vehicle to reduce the costs associated with companies who purchase similar types of material to perform the same function, as opposed to standardizing on one or two types of material which will satisfy the design requirements.
- Provides for a common baseline of standard approved, contractually compliant materials from which to select for design and construction applications.
- Enhances the ability of independent and partnered shipbuilding and marine supply industries to operate as teams by providing common materials, processes, procedures and communication.
- Enables and enhances co-procurement opportunities within and between partners , who may then share in the cost savings equally
- Dramatically increases instance of similar design, promotes design reuse, and provides for significant reductions in the use and procurement of non- standard parts.

All of these listed benefits, and many more, are available to companies who choose to design and implement a robust Part Standardization Program within their business processes. Although the initial design and deployment of this type of program requires concentrated focus and sustained support, the return on investment can be significant in the areas of material, design, construction and life cycle costs. Other savings can be gleaned from reductions in procurement, warehousing, administration and a myriad of other associated activities.

As U.S.Shipbuilders and other marine suppliers attempt to become more globally competitive, the implementation and enforcement of a robust Part Standardization Program within the industry will provide greater opportunities to strengthen our capabilities to gain a larger share of the construction and maintenance work undertaken each year.

The Methodology for Part Standardization will be provided in three distinct phases. Each subsequent phase will be built on the information provided in the previous phase. The



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information contained herein is considered as Phase I. It provides a general overview of the entire process and establishes the building blocks for setting up the infrastructure of the Part Standardization Program. The purpose of Phase I is to identify and communicate the basic steps necessary for design and implementation, and to acquaint the reader with the basic Part Standardization concepts. Phases II and III will follow and will provide additional detail.

Although there are many varied facets of Part Standardization that can be examined and considered, this methodology will encompass only that portion of Part Standardization that is under the direct control of the implementing activity, such as shipbuilders and design agents. Part Standardization, however has a direct relationship to Industry Standards, as well as, other initiatives like the shift to COTS equipment rather than MIL spec. It should be noted that while it is recognized that all of these topics are related, design and deployment of the Part Standardization program within the shipyards/design agents is the focus of this effort. This should not diminish the role that Industry Standards will play in the future. A close relationship should exist between the development of Industry Standards and a very proactive Part Standardization Program. For the purposes of this task however, The Industry Standards relationship is considered out of scope.

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## **1.1 Identify Prerequisites**

### **1.1.1 Securing Senior Management Commitment and Support**

The design and implementation of a Part Standardization program requires extensive support and commitment to be successful at start-up and over the long term. Paramount to the success of the effort is the level of support and endorsement by the upper management sponsor. The role of the upper management sponsor is to empower and sustain the assigned Team Leader / Manager and the other individuals who are setting up and maintaining the program. These individuals should be granted the requisite authority to design and deploy Part Standardization across the company, in accordance with company goals and objectives for cost savings, process improvement and part reductions. Proper communication throughout the enterprise regarding the benefits of Part Standardization, and the intentions of the company to adopt new philosophies, needs to take place with all of the other upper management individuals whose processes or operating procedures will be affected. Proper reporting structures should be set up for the program to run as efficiently as possible. The upper management sponsor should be someone within the company who is knowledgeable regarding the benefits of Part Standardization, and it is further recommended that this individual be associated to upper management to ensure maximum support will not erode over time. The following will define the general roles of both the upper management sponsor and the team leader/manager. For further information relative to organizational structure recommendations see **Phase II sect 2**.

Part Standardization Program Sponsor shall ensure that:

- Clear and concise expectations regarding the future role of Part Standardization have been communicated throughout the entire company.
- Aggressive but attainable and measurable goals have been set for the Part Standardization Program
- Sufficient budget has been established to carry the program through to completion and deployment.
- Assignment of an experienced and knowledgeable Part Standardization Program Manager has taken place. This individual should be a direct report to the upper management sponsor.

Assigned Team Leader / Manager will ensure:

- That proper communication takes place at all levels regarding the purpose and expected results of the program. The team leader will act as chief spokesman and communicator for the company. This particular responsibility is extremely important because it ensures that everyone within the organization is aware of the company's long term commitment to the project and it's success.
- A sufficient number of individuals with appropriate skill sets have been assigned to the project

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- That the Part Standardization team is a team comprised of dedicated individuals who are not encumbered by other assignments.
- Necessary resources are available as needed to support established scheduled goals.
- Solicit and review suggestions for standardization received from various areas of the company.
- That a system of measurements is in place to ensure and capitalize on the success of the program, including, and most especially, the costs which have been avoided or directly reduced as a result of attaining goals associated with Part Standardization.
- Proper documentation of the process and that operating procedures are developed, maintained and communicated

Securing Upper management and sponsorship of a Part Standardization project can sometimes be difficult. In the complex business processes used today, sometimes the potential benefits of a successful program are hard to identify and quantify. It is often helpful to break down the benefit elements of a Part Standardization Program to see where the benefits fit into and improve the existing business methods, to show cost savings. One of these areas is shown and discussed below, with suggestions for associating cost savings or cost avoidance. Additionally, suggestions for identifying other potential areas for cost and performance improvements have been listed. Using these methods and documenting potential cost savings and or process improvements can assist in building a convincing case for implementation of a Standardization Program.

Part Standardization relies heavily on the avoidance of the creation of duplicate parts and strongly promotes the design reuse of similar parts wherever possible. By associating the costs of each of the parts to an exact dollar figure that is required to specify, document, purchase, warehouse, transport and inventory manage several identical parts as opposed to one, significant cost avoidance can be documented. As an example, consider a simplistic scenario. If the company calculates that the purchase and use of a fastener across the entire enterprise costs \$200.00, and it can be proven that there are several instances of the same or similar fasteners that will do the intended job, elimination of the duplicate items would result in significant cost avoidance. If the company has, in its material systems, three fasteners that would satisfy the requirements, and can eliminate two out of three, that generates a net savings in cost avoidance of \$400.00. When you consider these types of scenarios across the large volume of diverse parts as managed by a shipbuilder, or specified by a design agent, the cost savings, or cost avoidance results can be significant. Using Part Standardization to reduce the volume of usable similar parts that are allowed for any given design will allow companies to utilize these type of cost benefits

While it is recognized that reducing the usable number of parts for any given design is important, this does not minimize the impact that simple teamwork across the company can have when deploying a Part Standardization Program. The use of Part Standardization, when designed and deployed correctly will have a positive impact on internal company relationships by promoting the sharing and comparison of parts information. It is also important to note that eliminating Parts from the usable part database when creating and implementing new design should not have any impact on

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emergent design's schedule. The deployment of a program should enable rather than restrict the abilities of any designer/engineer to use correct and standard material in the design. If the designer/engineer needs to introduce a new part to perform some specific function, the Part Standardization Program shouldn't restrict or impede that activity. Instead, a Part Standardization Program should assist and promote the use of new technology or new designs for parts that would enhance the abilities of that designer to create a cost-effective end product. The use of Standardization philosophies should cause the implementing company to use an extra measure of scrutiny on new parts being added into the system. The company needs to be responsive to the ever-changing face of material requirements, as new technology or design improvements are brought forth.

Additional potential savings from the use of a Part Standardization Program can be identified via a referenced specification to this document. National Aerospace Standard NAS 1524 can be used to calculate cost savings and cost avoidance from the elimination of duplicate parts or streamlining of processes which would seek to add or promote the use of duplicate parts. Some of these topics are listed below for reference. It is suggested that companies who wish to implement Part Standardization use this document to calculate the baseline savings in both reduced materials costs and increased efficiency in process. Referenced potential savings areas include, but are not limited to:

- Standardization savings from increased quantity purchases.
- Standardization savings in paperwork and handling.
- Standardization savings from reduced storage and handling.
- Standardization savings from reduced engineering search time.
- Using stocked parts in lieu of non-stocked.
- Using a design standard in lieu of individual documentation or specifications.

The reader should recognize that since every company is different, processes and common practices are very diversified. The NAS standard, as referenced, provides an excellent baseline for savings calculation, as opposed to any formulas which could be presented here. The writer has purposely avoided any detailed formula calculation in this phase in an attempt to keep this methodology as generic as possible. Participants are encouraged to use the NAS as a baseline and adjust the formulas to suit their own individual business needs and processes. Documenting existing materials costs within your company and using those same cost calculations, as applied with a Part Standardization Program, can identify specific savings that will be useful in convincing upper management to implement a formal Standardization Policy. Additionally, the use of Part Standardization also identifies potential areas for process improvement. Individuals in the organization can be authorized to document the existing business processes, with associated costs. These same individuals can be tasked with re-calculating the business process costs while employing Part Standardization practices. The resultant difference in costs, or cost avoidance, due to process improvements can be used to measure the potential effectiveness of the program and validate the necessity for it.

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It is important for the reader to recognize that all shipbuilding and design firms are different. Each company has their own unique set of processes and procedures that have been developed over time. Companies who only design small yachts or other smaller vessels may elect a different approach to an aggressive Part Standardization Program. In these types of companies, it may be more difficult to identify and quantify savings to be gained from implementation of their own program. Some of these smaller companies may wish to collaborate with their customer to become familiar with the customers' goals and objectives regarding Part Standardization. A small design firm for example, may wish to restrict particular types of materials from their design which would result in significant savings for their customer that is actually constructing the vessel. By promoting Part Standardization as a design firm and acting as an advocate for the process, many of these companies can become more cost efficient for their customer. As stated before, Part Standardization, when properly executed can result in significant cost savings and avoidance.

For further explanation of the following topics, see Methodology of Part Standardization Phase II.

- Part Standardization practices in small yards and design firms vs. Full Service Contractors
- A voluntary elective Part Standardization Program in lieu of one which is mandated and directed by the customer.
- Implementation of Part Standardization on a mature contract as opposed to implementation at the beginning of design and construction.

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### **1.1.2 Establish the Dedicated Team and Appoint a Leader**

Along with proper sponsorship and support, a dedicated team is also crucial to the success of the Part Standardization Program within the enterprise. The appointed Team Leader or Part Standardization Program Manager needs to be as unencumbered by other assignments as possible. While it is certainly possible to accomplish Part Standardization with part time personnel, it is strongly recommended that the people that are selected be able to respond quickly to a variety of communications, organizational and technical issues as they arise. The Team Leader and/or Program Manager should have the design and development of the Standardization Program as their top priority. The individual team members should be assigned as full time members of the team. After the program has been set up and implemented successfully, the individual team members can act as communication liaisons and “technical experts” from their respective design, ILS or quality groups

The reporting structure of the team is essential to its success or failure, the more reporting layers there are, the longer it takes to get the tasks accomplished, and potential issues resolved. The example shown herein is a two tiered system. The initial qualifications and responsibilities listed below are given here to provide an example of the types of individuals who should be assigned to the project. Phase II will expand and further detail these responsibilities. In addition to the types of qualifications listed below, it is beneficial to provide a good mix of talent, experience and ability. The requirements supporting a Part Standardization infrastructure are changing. Issues such as Life Cycle Cost, Affordability, Availability and long-term support considerations have become increasingly important. With this in mind, a Part Standardization team should consist of members who have sound familiarity with all of the subject matter. If these individuals belong to a home department within the company, they should be empowered to represent the best interests of the company as a whole with their respective subject matter expertise.

#### **Definition of Qualifications, Roles and Responsibilities**

##### **Part Standardization Program Manager Qualifications:**

- Direct report to senior management
- Excellent communicator
- Extensive familiarity with marine related systems
- Solid understanding of the characteristics of a variety of materials.
- Knowledge of internal and external design activities.
- Familiarity with change processes within the organization.
- This individual must be empowered to make and enforce decisions for the entire company relative to achievement of company Part Standardization goals, objectives and philosophies.

##### **Part Standardization Program Manager responsibilities:**

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- Create and communicate the overall Part Standardization vision
- Develop and communicate a Part Standardization Program Plan according to the corporate or company requirements set forth by the VP or CEO.
- Develop and issue, with approvals, the Part Standardization policy statements
- Initiate and deploy procedures for Part Standardization
- Ensure that methods are in place to measure the effective results of the Part Standardization Program after it has been deployed.

### Part Standardization Team Leader Qualifications:

- Excellent communicator, both written and verbal
- Ability to promote the vision and communicate the desired goals down to the individual workers.
- Extensive familiarity with multiple material disciplines
- Interpretation, administration and distribution of established Part Standardization procedures
- Extensive familiarity with internal and external company change processes.
- Ability to oversee a multi-disciplined task team.
- Relevant experience in budgeting and manpower requirements in support of team initiated material reviews.
- Must be assigned with the requisite authority to enforce established Part Standardization procedures.
- Lead the effort to develop and distribute Part Standardization Criteria

### Part Standardization Team Leader Responsibilities:

- Participate in the development and administration of the program where necessary
- Coordinate activities of individual discipline specific, procurement and QA team members in support of ongoing team activities.
- Chairperson of the Part Standardization Review Board.

### Part Standardization Team Member Qualifications:

- Intimate familiarity with at least one design discipline. (I.e. Electrical, piping, machinery, vent etc.).
- Knowledge of CAD Platforms and company software material control systems (if applicable)
- Strong PC skills
- Good strong general design and production environment.
- Participate in and cognizant of the company material change processes

### Part Standardization Team Member Responsibilities:

- Communicate established and approved Part Standardization policy throughout the entire design area.
- Be able to work independently to analyze new material requests and make recommendation as to the “standardness” of specific item requests.

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- Proactive and expedient in performance so as not to delay the design cycle.
- Work as a member of a focused team to promote Part Standardization and assist in quantifying and providing status of its' use throughout the company
- Assist in the development and distribution of Part Standardization Criteria by commodity.

### Quality Assurance, Procurement and Production Involvement:

- The steady involvement and experience of these types of individuals is extremely important
- Since changes to standard parts in any organization are often brought about by Vendor changes or quality control and delivery issues, The direct participation of these people is mandatory.
- Assist in the development of Standard Parts Criteria, by providing pricing, lead time and delivery information when needed.
- Participate in the Part Standardization Review Board new parts review as required.
- Fostering teamwork and input from a variety of divisions and areas within the company is a very important consideration.
- Provide continuous feedback regarding new technology, vendor part configuration changes and potential design change opportunities that could potentially save the company money in procurement or production process enhancements.



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#### **1.1.3 Defining Data Architecture Parameters**

The underlying theme that Part Standardization promotes is a strong desire to enable proper parts selection and usage throughout the entire design, procurement and manufacturing cycle. Part Standardization seeks this end result by establishing a distinct process and level of control over what parts may be added it takes these issues one step further by providing the ability to define and determine the application of specific parts to specific uses, or a broad range of uses. Part Standardization does this essential work by creating Standardization Criteria and then applying the information contained in the criteria against the potential benefit of a new part request .The purpose for this section is to explain, in general terms, how various systems that contain materials data within the company can be used together to assist in the implementation and enforcement of a Part Standardization Program. Assisting with the process of proper parts, selection and usage throughout the company can be achieved by applying more stringent process enhancements to the overall selection and part addition process, and then using the internal material systems in the company to help enforce the revised policy. This section is concerned with establishing the environment which makes part control possible. The following will serve to illustrate some suggested areas of focus and approaches. For clarification purposes, the use of the word “control”, is not intended to apply to people. Rather, Part Standardization relies on the “control” of the proliferation of non-standard parts that can be selected, by instituting and enforcing a more formalized process. None of the steps outlined herein are intended to restrict the creative abilities of any design, engineering or procurement personnel. The implementation of a Part Standardization program restricts those parts that are considered non-standard from being selected and used in the design. Unfortunately some attempts at Part Standardization have failed due to the perception that the word “control” restricts creative design. On the contrary, the proper development and deployment of Standardization practices enable the use of proper parts and promotes the use of standard parts while freeing the user to concentrate on design tasks in lieu of worrying about whether parts are correct or not. The decision and research to determine the parts which can be used will have already been made.

#### **Establish Parts Management:**

Each company who wishes to employ Part Standardization practices should evaluate their own internal material management systems, computer systems and business processes for the effectiveness of their parts control. It is very beneficial to establish one area within the company to funnel all changes, additions and deletions of materials. Since the material catalog of most companies generally contains all of the pertinent data relative to part types, configurations, preferred vendors and the like, it is, for most companies, the most logical place to establish an enhanced process. In contrast, some of the larger design and shipbuilding companies have employed the use of a Part Data Manager (PDM) to act as the repository for their parts information Still others have used their purchasing systems. By establishing one area within the company that assumes responsibility for material and design configuration and control, the ability for everyone affected to have the ability to always view and work with the latest information available is established. This essential step is fundamental to Part Standardization. Establishing

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one area of scrutiny will eliminate a multitude of confusion and communication problems.

### Configuration Management:

Establishing stringent CM procedures to manage the actual physical characteristics of the part and how it interacts with the surrounding design is critical to the success or failure of any design and or shipbuilding contract. Proper application of the “Form, Fit and Function” rules for parts is necessary to maintain the integrity of the designed final product and to assist in identifying impacts to the entire design when changes to parts occur. Since changes to physical characteristics of parts are driven by a variety of internal and external activities, it is important to ensure that all the potential impacts are reviewed by one area of the company for part impact evaluation. The subsequent changes to parts that happen as a normal course of doing business need to be effectively communicated to all others in the company. This is accomplished by evaluating potential changes against Standardization Criteria and adding the parts or justifying the changes to criteria based on an enhanced process or part improvement.

### Proper Communications:

The communications between systems for managing material configuration in the company is equally as important as communication between people in the company. All of the systems that contain the materials or have impact to materials need to have the ability to communicate effectively. How this is accomplished depends on the number and complexity of internal company systems. The preferred method is for them to communicate electronically. If this is not possible due to platform difficulties or language and programming barriers, a manual, proceduralized and audited method needs to be developed. This method will ensure that information is communicated in a timely fashion and that everyone in the company is aware of changes and issues that have taken place relative to impact to existing or future design and material configuration. Parts and standardization criteria will change. The ability to effectively manage that change and communicate the evaluation results to all affected users is the essence of a good Part Standardization process.

### Links to CAD Graphics:

Since many modern companies either are, or are planning to operate using modern CAD Library design tools, it is important to briefly discuss the relationship which should exist between the Material Catalog and the CAD Library. Although a link to CAD graphics is not required to implement a Part Standardization Program, some companies may find it helpful to ensure that the changes or additions, which are part of the normal business processes, are effectively communicated to the end product design. Some catalogs, particularly more modern ones, have integrated text and graphics. Many companies are still operating in separate environments for each of these tasks. Ensuring that a strong relationship is maintained between these two entities will be beneficial to proper parts management and control. Creating an electronic relationship between the textual information contained in the catalog repository and the CAD Graphic Library Part which represents a piece of material is the most efficient method of maintaining proper controls.

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If this method is not feasible due to systems difficulties, older computer environments or some other reason, a manual, proceduralized and audited method must be developed and maintained that ensures that this vital communication takes place and is effective. The text and description of a part and its graphic representation must be synchronized at all times.

### Links to Other Systems:

Obviously, the size of the company, the complexity of it's business processes, and the relative age of it's internal systems, if electronic systems are used, has a great deal to do with the communications capability that it can create and maintain. Part Standardization is best served when all the systems within a company are linked together. There may be situations however, where creating electronic links between systems is just not possible, or is too expensive, or is deemed undesirable due to age for the relative benefit. Part Standardization can still be accomplished, and can be done very effectively provided that the goal of maintaining proper communication among corporate entities is maintained. The efficient flow of information from all areas of the company, through the Material Catalog and then back out to the affected areas of the company is the most important consideration. For additional details on a "manual" process versus one that is "electronic", **see Phase II section 4.**

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#### **1.1.4 Establish and Communicate Terms and Definitions**

As we have seen in the last two sections, communication among various areas within the company is a key factor when designing and deploying a Part Standardization Program. It should be understood that Part Standardization, when deployed and managed properly provides an environment that enables proper communication among various areas of the company. Integral to the solution to communication issues is the use of common languages and meanings. The establishment and distribution of a list of common definitions for Engineering, Design, Material Definition, Planning Operations and Procurement can go a long way toward eliminating, or at least minimizing difficulties and potentially expensive mistakes. The use and deployment of a Part Standardization Program could be considered a de-facto language that allows people in various areas of the implementing company to communicate better. By establishing common terminology, meanings and approach, many companies have eliminated some of their recurrent design and procurement problems by employing common communication language.

Expensive and costly design and procurement errors can occur unless understanding and acceptance of the terms and definitions by all involved parties is reached. Once the root of the problem has been discovered, it usually takes a team of people, from various areas of the company, a significant amount of time to meet, discuss the issues, and come to some reasonable degree of resolution. Usually this can be a somewhat painful and expensive endeavor. Proper communication between the various groups and departments must begin with commonly understood and accepted language and definitions. The following list of terms and definitions, is provided as part of this package, but is, by no means, meant to be all-inclusive. It is up to each company, to discuss, debate and provide accepted and universally understood language and definitions which fit their own individual business processes. The list is provided for guidance only and can be adjusted to suit the business conditions and systems of each company. The main theme of this section is to ensure that whatever meanings and impacts are meant by these definitions is universally understood and accepted.

##### **Part Number:**

A number assigned to uniquely identify a specific item. If an existing part number is modified, so that interchangeability is affected, assignment of a new part number will be made IAW established procedures, engineering, quality, planning, materials management and operations.

##### **Equivalent Part Number:**

A part number that can be substituted without adverse effect on the technical or contractual requirements of the other part or its' related systems.

##### **Interchangeability:**

Exists when two or more items possess such functional, physical, quality and contractual characteristics as to be equivalent in performance and durability, and capable of being

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exchanged one for another without alteration. Interchangeability extends to repair parts; provisioning data and any other supporting documentation necessary to purchase, manufacture or maintain the item.

#### Procured Part Number:

A part number procured from an outside vendor through the purchasing department.

#### Standard Part Library:

The listing of approved standard part numbers, which have been evaluated against specific design and cost criteria, and are provided for use by the design team. This term can apply equally to both the Material Catalog and CAD Library Parts.

#### Standard Part Number:

A procured part number that has been screened through applicable commodity standardization criteria.

#### Standardization Criteria:

A formalized set of qualifiers document, which identifies criteria to determine standard parameters of material items by commodity or material type. The creation and maintenance of these documents are contained in the Part Standardization Criteria Manual, which forms the basis on which a Part Standardization Program is initiated and maintained. (See section 2.2.1 through 2.2.1.2 for detailed explanation.)

#### Document:

The term document applies to the information content of a variety of different entities that contain technical data. A specification, drawing, sketch, list, standard, pamphlet, report or other data information relating to the design, procurement, manufacture, test or inspection of the part number.

#### Sole Source:

Indicates the only known qualified source of supply for the item specified.

#### Or Equal:

Indicates that there may be other sources of supply other than the one that is listed in the description. To use a different product other than the one specified, requires an in depth evaluation of form, fit and function prior to procurement.

#### Only:

The term used to indicate that the source of supply is either Government directed or sourced from only one vendor to a judgment decision or company preference.

#### Government Directed:

A single or multiple source of supply for a particular item which has been mandated by the use of contract language or Military Specification Qualified Products List. Procurement from a vendor other than those specified in this manner is not allowed.

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### No Vendor Listed:

When there is no apparent Vendor listing to guide the purchasing agent, the item may be procured from any vendor who meets or exceeds the directed contractual or specification requirements.

With the above definitions and terms as a starting point, it is recommended that each company who adopts this methodology as their own, gather the right people together within their company to share this list as a baseline. As the program is developed within the company, the need will arise for extensive familiarity with the accepted Term and Definitions. It should be noted that the formalized list of terms and definition should be reviewed periodically, revised to add new items and distributed globally to ensure continuity of approach. Direction must be provided to ensure that the understood and accepted term do not become arbitrary, as changes in company structure or leadership may impact interpretation.

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## **1.2 Collect and Define Requirements.**

### **1.2.1 Contractual Directed Requirements**

Each contract that is competed for and won has a singular set of contractual requirements for the materials which must be reflected in the configuration, testing, procurement and installation of the individual components and the final end product... Each contract carries with it, a unique set of requirements that must be fulfilled to the satisfaction of the customer for the product. Essentially what this means, is collection, annotation and management of all the contractual requirements that are placed upon the company. These requirements, for materials, can come from a variety of sources and they provide the baseline of requirements for all of the required materials for construction. These specifications “define” what the equipment or parts will look like, as well as, defining the performance and testing criteria. Some examples of the types of contractual requirements which affect materials are listed below. This list is not meant to be all-inclusive, but is provided to give examples of where material requirements that must be adhered to, come from.

#### Navy Ship Construction:

- Ship Specifications
- Military Specifications
- Project Peculiar Documents
- Navy Directed Supply Sources
- COTS Specifications
- Performance specifications
- Scantling Drawings.

#### Commercial Construction

- Ship Specification
- Vendor Selection
- Owners Specifications
- Material Availability

When viewed together, these specification requirements can present a formidable obstacle to administer and manage

One method, which has proven to be successful for dealing with the sheer volume of information that must be managed, is to create a “Specification Effectivity Index” This index is created in the form of an electronic database that contains all the applicable contractually invoked specification/revision information. It is developed in a business application database and contains all of the pertinent data and history of invoked specifications. The specifications are then linked to the internal company part number or

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catalog number that is used for the specific part. This type of index is particularly useful because the “configuration” of the individual parts can, sometimes change with each successive revision to the invoked Military or Commercial specification

### Specification Effectivity Index

<u>Item</u>	<u>Specification</u>	<u>Revision</u>	<u>Effective Date</u>	<u>Part Number</u>
Valve Globe	Mil-V-1189	A	Jan 01,1998	12225-022
Flange, STD	ANSI B16.5	A	June 23,1973	15055-123
Bar,Flat	Mil-S-22698	B	Jan 01 1995,	41004-096
Bolt, stud	Mil-S-1222	H	Feb 22,1987	53098-451

As can be seen in the small example above, the Specification Effectivity Index is used to keep track of what specifications and revisions are contractually applicable to what part. This is important because the effective issue of specifications is often times changed during the life of the contract as new technologies and material availability and sometimes price, drive changes to the configuration or “Form, Fit and Function” of the parts. The “effective issue” of a part is defined as “the invoked document’s revision that was in effect as of the signing of the construction contract or other specified date which is invoked in the contract”. This typical example is based on Military Specifications being invoked on the manufacturer of specific parts. If the parts were commercial in nature and not subject to the rules governing Military parts, then the Specification Effectivity Index can be used to control the configuration of parts by Vendor Part Number. In essence, the Vendor part number and the configuration of a part that it represents can become the “Standard Baseline”. In each case, Military or Commercial, the collective requirements imposed by the specification form what is called the “Contractual Configuration Baseline”. In the beginning of any new design, this baseline forms the basis of what the design, manufacture and construction requirements are and forms a “picture” of what the end product will look like. As time passes, new technologies emerge which can affect the existing configuration of the parts as they were purchased and installed. Some manufacturers will make improvements to their individual products which affect what each part looks like and how it fits into the overall design. Military Specifications are often reviewed and updated which drives change to the individual parts that they govern. The Specification Effectivity Index allows the company representatives who are in charge of parts the opportunity to “control” what each part will look like in their own internal design of the end product and also how they interact with other parts within the design of the end product.

The information contained in the first part of this section is important because it shows the reader the relationship that exists between the invoked specifications and Part Standardization. In order to recognize what is “standard”, an understanding of how that “standard” baseline of part configurations was achieved is necessary. It should be noted that all future standardization activities against the individual parts will be evaluated against the baseline from this point forward. The primary reason for this is to ensure that



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whatever changes to materials are being considered can always be evaluated for technical compliance with the established baseline as part of the decision making process.

There are other scenarios which exist and that may impact the desire to implement Part Standardization. Obviously, not all entities relative to shipbuilding and design will operate in exactly the same fashion. There are instances where Design Agents, or executing yards who may not be full service contractors, will always use the latest revision of an invoked Military or commercial Specification and adjust their design and construction processes accordingly. The employment of Part Standardization philosophies and practices for these types of businesses is a little different. A Specification Effectivity Index would still be a useful tool, but additional research to determine the impact of changes to the design and construction process would be required. In order to determine the impacts, it would be most likely necessary to conduct a cost benefit analysis between one configuration of a piece of equipment and another that has a later or earlier revision that implements a configuration change. The CBA would be necessary to assist the design agent and or executing yard or any other combination in identifying the feasibility of making a specific change to materials based on:

- Part Costs (one revision vs. another)
- Cost to change drawings and documentation
- Long term supportability of the new item Vs the old item
- Impact to existing design (cost to change)
- Availability of the new item in the marketplace
- Production impacts (will the new part fit the same way the old one did)

Each of these issues and many more are required for these companies to make an informed decision relative to proper Part Standardization. Since it is impossible to detail out every potential scenario that could exist, the application and execution of a variety of these techniques, or any combination of them, may be required to achieve good standardization practices. It will be the responsibility of each implementing entity to evaluate the potential tools, compare the respective merits of each, and decide which efforts best fit their business process for the bet gains.

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#### **1.2.2 Controlling Design and Acquisition:**

The goal of this section is to identify those techniques and tools that can be used to implement Part Standardization and monitor the usage and acquisition of parts. By controlling what parts can be selected, you ultimately result in controlling a portion of the overall design and construction costs. To control the parts, you must control the definition and monitor the procurement / receipt inspection. In an attempt to illustrate the meaning of these concepts, and the tools and techniques that can be used, some of the major areas in the shipbuilding and design process that could be affected by Part Standardization will be briefly discussed below. Some suggestions for establishing and maintaining controls of process, selection, procurement and support are provided. The implementing entity may wish to consider one, some, or all of the information contained herein, and adopt those tools or process improvements which best suit their needs. Every circumstance and business process is different depending on the size of the business, what it's contractual requirements are and what type of vessel is being designed and constructed. In addition, each business considering the design and implementation of a Part Standardization Program must examine their own existing internal processes to determine where their strengths and weaknesses lie. After the evaluation is complete they may select those new tools and processes outlined herein which best compliment their own circumstances and which show the greatest potential for cost savings and success. It should be noted again however, that although the word "control" is used herein frequently, we are not seeking to control people, but instead wish to control parts selection and acquisition. This activity results in significant cost savings throughout the process of design, construction and acquisition, and should enable designers, engineers and procurement personnel to focus on issues which are deemed more important.

#### **Design:**

Since design is usually at the forefront of the various processes for control of materials. What follows is a listing and brief description of the tools that may be necessary for implementation of a Part Standardization Program

#### **Establish Part Configuration Baseline:**

Using the contractual specification data that was previously discussed in the last section, create a Specification Effectivity Index. Make this document or database available for those who are specifying parts, reviewing potential change and creating new design. It is also helpful to make this information available to the Procurement, Engineering and Quality Assurance people within the company, so that all individuals who have some degree of responsibility for the configuration of parts can use it as a valuable resource for decision making and reference, with respect to part configuration, availability and quality attributes. Additionally, depending on individual business processes, other input from other areas of the company will be necessary in order to make sure that all of the Part Standardization goals that were set are considered as part of the part selection process.

#### **Available Parts Visibility:**

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Although providing good parts visibility throughout the company is not a requirement for standardization efforts, the use of modern Component and Supplier Management software has proven effective at stimulating communication, and very beneficial in reducing the number of duplicate, or nearly duplicate parts in the material systems. These software programs enable easier searches by specific part attribute or series of attributes. These CSM solutions still rely heavily on the infrastructure set up that is being discussed, relative to parts criteria and specification compliance, but provide the information in a clear and concise way. The power of the software tool can be put to work for comparisons of technical characteristics, performance parameters and a myriad of other factors which do allow for quicker easier searches. In addition, one of their strong points is their ability to coordinate, sort and display a huge amount of information on any part which has been loaded into the system.

### Establish Standardization Guidelines:

Some companies, who wish to create and implement Part Standardization, but whose system infrastructure is not robust enough to provide electronic query capability, use an alternate method. These companies create and distribute Standardization or Part Application Guides. These guides are created based on “Standardization Criteria” (see definition) and are updated and distributed regularly for use by the design and procurement groups to select standard material for procurement and / or usage in the design or production of the end product. These standards can be electronic or manually generated paper copies. The guides themselves are usually organized by material type and application and are classified in such a way as to make item definition and selection easy for the average user. Although the use of application guides or manual Part Standardization guides is not the recommended approach, some smaller companies have been very successful in using them to promote and communicate their latest Standardization objectives. The other alternative which also has been useful is to create the standardization guides in a business application software program and provide them to users through the company Intranet. If the system is designed correctly, each subsequent change to initial issue of the document is available for use by anyone who has access to the database on their personal computer. The intent and the primary reason for these types of guides to exist, is to promote good communication and provide the latest Part Standardization direction to all affected employees.

### Establishment and Maintenance of Standard Parts by use of Standard Criteria:

Standardization Criteria is defined as those part attributes which have been reviewed and found to be contractually compliant and acceptable for the design end use of any given specific material. This criteria is listed by type of material and include application information, material type, military or commercial specification, testing requirements, and in some cases, may require procurement from only one specific vendor. These criteria are evaluated at the beginning of a design contract and used as a guide when considering the addition or change of “standard” parts. The parts themselves are generally presented to the user as “preferred” or “allowed”. Preferred parts are those parts which meet all of the Standardization Criteria without any modifications. Allowed parts are those parts which are considered to be out of compliance with the generally

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accepted criteria, but are allowed for use due to some specific end use need or other extenuating circumstance. Preferred parts are obviously the items which are used the most often and therefore represent little risk. They are also the items which are the most readily available in the marketplace and represent the “norm”. Allowed parts represent those items which could be questionable or are of low usage. In most instances there are not any other “preferred” parts that will accomplish the intended purpose or there are a limited number of available Vendors that will supply the configuration. In all instances, the strong desire here is to drive the users toward the use of “preferred” parts.

### Creation of Standardization Review Board:

This organization is generally a compilation of dedicated individuals from various areas of the company that governs and regulates the addition and use of parts. In some instances, these individuals are also responsible for the construction, distribution and maintenance of the Standardization Criteria that are used to segregate “standard” from “non-standard” parts. It is the job of these individuals to promote the use of standard parts whenever possible and to guide the addition of new parts. Their charter includes responsibility for the Part Standardization goals that have been set by the company. The Standardization Board Leader would also typically report to the upper management Part Standardization sponsor. The dynamics of the group can certainly change with the requirements of any given situation, but representatives usually include Engineering, Procurement, Life Cycle/ ILS and Quality Assurance at a minimum. These individuals, as well as, others when required, are charged with the administration and maintenance of the Part Standardization efforts of the company. Their functions are many, but essentially they act as the “gatekeepers” for all new part requests which are not in accordance with accepted standard criteria, as well as any proposed changes to existing configurations. They make these decisions based on experience and specification requirements, frequency or volume of usage, Life Cycle supportability and availability from industry. They also rely heavily on the established Part Standardization Criteria that are established at the beginning of the process. You may remember the single control point issue that was discussed earlier. Typically, one leader from this group would also have control of the Material Catalog, and act as the reference point for any and all material change. Essentially, what this means is that the single control point that was discussed has been established. Potential new parts therefore can only be added into the “available and preferred” catalog by evaluation and acceptance against established and consistently updated criteria. Their primary function and goal is to require validation and a demonstration of need for a new part throughout the entire process. They must, however, perform this function correctly and without disruption to the rest of the company schedule as part of Phase II, we will be examining “the Part Standardization Board” in greater detail and a suggested organizational structure and operating procedure will be provided. There are also a myriad of other organizational arrangements that are possible, depending on the existing structure and the depth of the task for the company. It should be noted that the control of materials by the Part Standardization Board is suggested, but not necessary for Part Standardization to be successful. Some companies who have a more advanced software and computing environment will rely heavily on

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their PDM (Part Data Manager) or ERP (Enterprise Resource Planning) systems to adequately control material specifications, procurement and acquisition.

### Coding of Parts

As we have discussed in previous sections, the parts configuration baseline is an always-changing entity which requires diligence to track and maintain. Companies who wish to embark on a Part Standardization program must realize that since the baseline is always changing, the Part Standardization Program must evolve and change with it. The program must also always ensure that despite the changes, the parts remain contractually compliant. Some parts will be added, after a standardization review, and some parts will be deleted, based on that same review.

The essence of Part Standardization dictates that the company remains focused on its pre-determined Standardization goals and objectives, and be flexible enough to adapt, as new types of materials and new technologies are introduced into the mainstream. The use of the previously introduced Specification Effectivity Index will be advantageous as parts are added into the system. Since the introduction of new parts related to emergent technology or more cost-effective procurements will affect the existing baseline, it will become necessary to “code” parts as obsolete or to prevent them from being incorporated into the future design. In many companies, these parts must retain their history and are seldom officially “deleted” from the database. As the Standardization Program is implemented and the baseline establishment begins to change, parts become obsolete in favor of other parts. A coding system, unique to each company, must be developed to segregate those parts which are desired for the future from those that are being eliminated from future designs.

It should also be noted that other factors drive the need for coding of parts. Vendors change and go out of business. The customer requirements are changed and a variety of other factors can drive configuration baseline change. Please bear in mind that each company must develop its own code and ensure that the meanings behind the codes are universally understood and accepted by everyone in the company who has a role to play.

### Using Part Codes to Control Design and Procurement.

After the parts in the company database have been appropriately coded, a system must be devised so that the Bill of Material and procurement systems that are used to acquire material recognize and react to the part codes. The reason that this is so important is so that the codes, as applied by The Standardization Review Board or other group as specified by the implementing business, cannot be undone or ignored by anyone else in the company. Once the decision relative to the standardness of a particular part has been made, that decision needs to be enforced throughout the entire process to ensure that non-compliant, non-standard or discrepant material is not substituted or procured. Proper part standardization must be an all encompassing effort that ensures that the proper parts which have been evaluated against the specific established criteria are specified in the design, ordered for procurement and received for installation. Many companies who have tried to standardize parts have encountered difficulty in this area. In many instances, production need, availability and other schedule constraints could cause individuals to take the easy way out and elect to use a part that is not suitable for the

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intended application, but whose characteristics and availability would solve the immediate schedule or production problem. This type of situation is very common, but every effort should be made to avoid this scenario. Allowing the use of non-standard parts where a suitable part is available undermines the overall authority of the Standardization Review Board and places the company in a less than desirable position in relation to expected cost benefits. Any savings that were originally identified by the initial standardization efforts will be negated by the application of a non-standard part, where a standard part was available. The very best way to control this situation is to have the computer programming that is inherent in any company recognize and support the standardization effort by preventing the requirements for non-standard materials from being specified or loaded in the first place. Using the part coding system in conjunction with the design effort ensures that the correct parts are specified and loaded, thus avoiding the cost inherent in dealing with non-standard or one time use parts. Using and promoting the use of the codes ensures that all of the other following activities will reap the benefit from the use of a standard part and design.

There may also be situations when a company is designing for multiple contracts. These contracts may have different overall contract requirements for the materials involved. Judicious use of the part codes, allow the company to segregate applicability of parts between contracts which in turn allows the company to save money by allowing proper materials selection for all the work that is being performed.

### Establish a Standard Parts Library

After the original large pool of parts has been reviewed against the previously created Standardization Criteria, those parts that are found to be “standard” should be provided to everyone in Design who needs access to perform part selection as a result of their daily functions. These parts should be provided in the easiest searchable format that the company could deliver. Each implementing entity is different, and the requirements previously discussed regarding software, application guides and system support need to be considered. Additionally, this is the group of parts which would benefit the most by a link to CAD Graphics. Additional detail relative to this function and process will be addressed as part of phase II.

### Linking to CAD Graphics.

Although the use of CAD is not a requirement for Part Standardization, The emergence of more modern technology over the course of the last few years has allowed greater control in many areas of the company infrastructure. Parts are no exception, and the use of Computer Aided Design Graphics has allowed some companies to leverage their design talents to significant advantage. Since parts are the fundamental building blocks of the design, proper parts links are also very important. Many companies have employed the use of CAD Library Parts to aid in the design of the overall product whether the end product is an entire ship or just a piece of equipment used in its construction. Since as earlier mentioned, change to the part configuration baseline is unavoidable, it will be necessary to ensure that whatever changes take place to the approved standard parts are accurately reflected in the graphic depiction of the CAD Library Parts. Here again the issue of communication is ever so important. Failure to

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properly notify the CAD group of technical or configuration changes to materials can result in a departure of the design from the end result intended. It is absolutely imperative that every change which could affect parts be evaluated within the structure of the CAD Library to determine if that change would affect the graphic depiction of the part.

### Procurement:

Involvement of procurement personnel in the Part Standardization Board and indeed, in the entire process will be beneficial to the overall effort. It is suggested that the Part Standardization Board or other governing body have at least one permanent representative who is assigned to provide information relative to the following:

- Material Availability
- Information regarding quantity buy discounts in price
- Problem supplier notification
- Notification of requirements and schedule for Vendor Competition
- Notification to the board of delivery
- Suggestions for alternate vendors or upgrades in materials.
- Liaison with other procurement people to provide procurement information in a shipyard partnership arrangement.
- Along with the procurement individuals' participation, also comes a need for availability of information. The availability of parts information is critical to all areas of the company, and procurement is no exception. The strong participation and buy in form Procurement is necessary to ensure that proper communication to a central governing point like the Part Standardization Board takes place.

### ILS Life Cycle:

Life Cycle cost and the administration of supportability factors have begun to play an increasingly important role in the selection and use of parts on naval and commercial contracts. Diminishing budgets and reduced shipboard manning levels have mandated the use of equipment and parts whose characteristics lend themselves well to long-term reliability. It will be necessary for those implementing entities, that are working on naval and commercial contracts to maintain close relations to an ILS representative. It is suggested that the Part Standardization Board or other governing body have a permanent representative from the ILS organization to help provide the following information:

- Data relative to Life Cycle Cost considerations regarding specific material types
- Reliability / Maintainability factors
- Mean time between failures
- Allowance Equipage List Data

Although many companies have this data available in the current systems that they use to track materials information, in some companies, it has not been a consideration until after the material has been selected. In the future of shipbuilding and design, this information will be essential when formulating Part Standardization Criteria and will have considerable influence on those materials which are being considered as "standard".

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### Quality Assurance:

It will be necessary to work very closely with QA and receipt inspection people at the company to ensure that the type and pedigree of materials that were originally specified, are actually what has been procured and received. By taking this extra step, companies who employ Part Standardization practices ensure that the Standardization program is effective. Company policy regarding deviation from specified materials needs to be created distributed and enforced. Additionally, proper channels of communication should be maintained between the QA group and the entity that the implementing company selects for maintaining parts data. The input of the assigned QA representative on the Part Standardization Review Board or other governing group will be invaluable. Some of the areas that they will assist with include, but are not limited to:

- Providing notification to the parts group relative to poor material quality
- Providing potential recommendations of vendors.
- Ensuring that specification data remains quality compliant.
- Providing results of periodic quality audits to assist in future vendor selection.
- Assist in the reporting of any production problems encountered with specific materials.

### Requirements for efficient selection of parts:

All of the diverse groups that have been mentioned above have common needs and requirements for materials information. All input that can be gathered from these groups is an important consideration for the entire Part Standardization process. The following list illustrates only some of the requirements that each of these groups have in common. It is not necessary to fulfill all of these requirements to implement a Part Standardization Program, but the list is provided as a reference point to illustrate the common baseline of information that should exist to ensure maximum efficiency and promote a successful program

- Access to a wide variety of parts information
- Ability to communicate with other groups in a timely fashion.
- Input into the part selection and standardization effort throughout the entire process.
- Proper notification to all of the groups regarding specific material related difficulties.
- Distribution of materials related issues and data to all of the groups. (i.e. standardization guides, application standards etc).
- Access to a wide variety of Vendor supplied information relative to what parts are available in the marketplace
- Dissemination of Government or Contractor supplied information or specification changes

### Audit Requirements for the Program:

In order to ensure the maximum effectiveness of the Part Standardization Program, it will be necessary to devise a system of measurements to determine the benefits that are being accrued by the implementing company. These benefits can be derived from a variety of activities associated with Part Standardization. Some of the potential measurable metrics are listed below for reference. This list is not all-inclusive. It will be at the discretion of



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the implementing entity to decide what activities to measure and much of the activity will depend on what portions of the standardization effort are adopted.

- Volume of duplicate parts eliminated from the parts system.
- Savings in warehouse, handling and inventory costs
- Savings generated from reduced search time for parts information
- Consolidation of specific parts or reductions in the total number of parts managed.
- Savings in design cycle time.
- Savings generated from specific process improvements resulting from Part Standardization.

You may recall the reference to NAS specification 1524 in an earlier section. This reference was used to build a convincing case to secure upper management sponsorship and support for the overall program. This same specification, and the formulas that are referenced in it, can be used to validate the specific savings that will be provided by implementation of the program within the shipbuilding and design companies who have implemented this methodology.

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### **1.2.3 Involvement of the Supplier Community in the Process**

Manufacturers of a variety of equipment and suppliers of raw stock components have an integral role to play in the formulation and deployment of a Part Standardization Program. Their expertise on their own equipment/material cannot be easily duplicated by anyone else. Many of them are very happy to assist in the decision making process, especially when standardization criteria is first being established. As the criteria is established and the design of the end product begins to take shape they can provide engineering and application assistance. With the decided shift in recent years to the use of COTS equipment and the marked shift away from Military Documentation, it will be more important than ever to develop and sustain good working relationships with the bulk of the suppliers. Since a good quality Part Standardization effort takes teamwork, having the involvement of the Vendor Community in the decision making process can be very beneficial. The following list illustrates only some of the benefits:

- Vendors can provide advance notice of product changes which would affect configuration.
- Historically, it has been possible to work with vendors to establish minimum quantity buys and advance ordering data.
- Vendors can provide stocking and availability information when a decision is being considered relative to equipment changes.
- Application and service engineering information can also be provided.
- Supportability information is also kept by the vendor, relative to mean time between failures, frequency of equipment overhaul, availability of spare parts and the like.

When it comes to instituting a Part Standardization Program, it is very beneficial to involve the Vendors right up front as part of the process. As with any program, and as we have discussed previously, communication between the Vendors, shipbuilders and the customer needs to be strengthened and maintained. In most cases, it is far less expensive to plan for an equipment change, than it is to react to it after the fact. Additionally, when considering an equipment change brought about by design or system performance problems, the application and engineering assistance that can be provided by these companies can prove very cost beneficial.

Some companies have begun to establish and maintain solid working relationships with vendors using the Internet as a communications tool. In some cases, downloads of Material Specification Data, CAD Graphics, Performance Characteristics and other information are downloaded directly into the company's material systems. There are also a myriad of open forums where a large group of vendors and shipbuilders / designers meet periodically, in a non-adversarial setting, to discuss and resolve shipbuilding and design issues. These forums can be an excellent resource used by implementing entities to establish working relationships. The Marine Machinery Association, the NIIP Consortium and SPARS are but a few of the possibilities.

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## **1.3 Establish Methodology**

The documentation that supports a formal Part Standardization Program is an integral component of the methodology. These references, guides and procedures will be required to provide detailed guidance and direction regarding the successful implementation of the Part Standardization Program. The list of these documents is divided into categories for convenience and ease of understanding. All items on this list will be developed as an ongoing effort associated with phases two and three of this project.

Additionally, it should be noted that there are also other circumstances that have a direct impact on the documentation listed. Since not all interested companies are constructed alike, and do not all have similar responsibilities, some of this reference material will need to be adjusted to fit a large variety of different circumstances. For example: Not all companies are full service contractors. Some design agents are only interested in the design process and are not responsible for any production impacts or issues. As this methodology is developed and deployed, the authors will make every attempt to account for as many diverse scenarios as possible. We will provide all of the basic requirements for the design and implementation of a strong Part Standardization Program, and will make note of where specific requirements associated with other circumstances may not be required. It is up to each implementing entity or company however to assist by attempting to recognize where generalized processes and procedures depart from their particular circumstances. It is also noteworthy, that this list will likely be adjusted and refined as the rest of the methodology requirements are identified.

### **1.3.1 Procedures:**

#### **1 Establishing Standardization Criteria by material type and commodity**

This procedure will provide suggestions and examples for organizing parts information and will demonstrate some specific structure suggestions. It will also detail the concept of what Standardization Criteria is and how it is created and organized to form a Standardization Criteria Manual. The relationship between the manual and actual material requirements will also be detailed. The level of input requirements from various areas will be defined.

#### **2. Coding of Parts**

Creation of Code definitions and support programming requirements. This procedure will provide suggested codes and outline methods to secure buy-in and universal understanding of their meaning throughout the implementing entity.

#### **3. Procedure for Creation, Operation and Maintenance of Part Standardization Board.**

This procedure will outline methods of creating a part governing body within the organization. It will detail additional membership requirements, process and input requirements. This procedure will also cover such things as:

- Involvement of ILS,QA and Procurement people

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- Reporting structure
- Part Standardization guidelines
- Creation of standard parts
- Leader / member interface requirements
- Identification and prioritization of standardization part candidates.
- Meeting schedules and operating rules
- Statistical reporting and standardization auditing requirements.

### 4. Establishment and Maintenance of a Standard Parts Library

Defines the requirements and procedure for library establishment, potential links to CAD Graphics, administration of possible changes and details the relationships between systems for materials information within the company.

### 6. Part Standardization Board to Engineering and Others Interface Requirements

Will detail the company interdepartmental relationships that must be created and maintained to effectively implement a Part Standardization Program.

### **1.3.1 Process Flows:**

1. Part Standardization Board
2. Part Catalog Relationships to other material systems
3. Part Standardization Board Organizational and reporting Structure
4. Internal Material Systems management considerations

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#### 1.3.2 Conclusion

There have been many concepts outlined in this phase of the Standardization Methodology. These concepts form the basic building blocks of a successful Part Standardization Program. Of all the concepts and requirements that have been outlined herein, there are two which stand out above the rest as being fundamentally more important to the ultimate success or failure of the program.

The first and most important consideration, is the requirement for *absolute* support and buy in from the upper management sponsor. This requirement is essential, not only at the beginning of the program, but all throughout it's design, development, implementation and maintenance. The second and almost equally important consideration is the issue of communication.

It should be understood that all of the very best designed standardization functions, programs and philosophies are doomed to failure without this essential element. Standardization will have a dramatic effect on process, design and construction cost and performance, but not without proper and sustained communication.

A recap of some of the other important points discussed in this phase follows:

- Establishing a team with the right people is essential to success
- The entire company should be educated and trained on the benefits of Part Standardization.
- Data Architecture design can help or hinder the program. Essential systems should be able to communicate with each other. The ability of these systems to communicate is almost as important as people being able to communicate with each other
- Defining accepted terms, phrases, acronyms and definitions, and ensuring that their meanings are universally understood and accepted is of considerable importance.  
To begin a successful program, you must first collect all of the contractual requirements for the materials and systems that are involved.
- Creating Part Standardization Criteria based on the collected contractual requirements forms the baseline for what is considered a "standard" part.
- Creation and maintenance of a Specification Effectivity Index is helpful in managing the configuration of parts
- The underlying theme of a Part Standardization Program is a strong desire to control the specification, acquisition and support considerations of materials throughout the entire design and construction process.
- Part Standardization is an always-changing scenario, subject to a variety of internal and external forces that drive changes to the listed material configuration.
- Some companies have robust software programs in place while others must rely on manually generated Part Standardization and Application Guides Parts Visibility across the company is something to strive for regardless of the method.
- Creating and maintaining a Part Standardization Board to act as a governing authority to regulate and administrate the addition, use and disposition of parts is the recommended approach. It is recognized that some companies will not need to develop this level of detailed analysis and management to be successful.

## PHASE I ESTABLISHING PART STANDARDIZATION METHODOLOGY APPROACH

- Proper communication and involvement from a variety of areas within the company will be required to assist in instituting the right kind of program.
- Each implementing entity is different. Some are full service contractors, some are only concerned with design, while others are only concerned with construction. It is up to each company to determine which methods and activities or combination of them will best suit their needs and fulfill their standardization goals.
- Involvement of the supplier community will be very beneficial.

Phase II will provide a full set of operating procedures and flow charts which will assist the reader in fully understanding and implementing the concepts contained in this document.

**NATIONAL SHIPBUILDING RESEARCH**  
**PROGRAM PROJECT**  
**6-98-2**

**PHASE II**

**IMPLEMENT PART STANDARDIZATION**  
**METHODOLOGY**

PHASE II  
IMPLEMENT PART STANDARDIZATION METHODOLOGY  
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## PHASE II IMPLEMENT PART STANDARDIZATION METHODOLOGY

### **Introduction**

The purpose of Phase II is to provide the detailed approach for the design and implementation of a Parts Standardization Program. This approach is based on the requirements outlined in Phase I of this National Shipbuilding Research Program, (NSRP) Project 6-98-2.

This Phase is applicable to the Shipbuilding Industry regardless of whether the company is large, small, commercial, military, design only or any combination thereof. Although each of the type listed above and the subsequent implementation approach is not addressed specifically, the phase is intended to provide the basic architecture for implementing a Parts Standardization Program. It is a company's responsibility to select from this Phase, the elements, which are most applicable to their unique business and build their own specific program.

Phase II will touch on the following events that must take place either in whole or in part in order for effective implementation of a Parts Standardization Program and the maintenance thereafter:

- Implementation of a process for gaining sponsorship and approval of a Parts Standardization Program from senior management or a process for developing a program that is contract driven versus company initiated
- Establishment of a governing body to manage the Parts Standardization Program
- Development of criteria for defining standard parts
- Evaluation of parts and categorizing as standard and non-standard
- Development of processes and procedures for controlling parts standardization and its role in design, procurement and manufacturing
- Development of training for the standardization process
- Auditing the Standardization Program for adherence to established procedures
- Measurement of and reporting program effectivity.

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**KEY PHRASES, ACRONYMS &  
ABBREVIATIONS**

Section 1.1.4 of Phase I, Establish and Communicate Terms and Definitions, addressed the need for common meanings of engineering, design, material definitions and procurement terms in order to avoid communications issues. To that end this section of Key Phrases, Acronyms and Abbreviations is established to avoid the potential of communication issues with regard to Phase II Parts Standardization Methodology.

**KEY PHRASES**

**PART CODING:** Code number either alpha or numeric that can be assigned to a particular part or group of parts that defines the limits of usage of. Examples of such limits could be:

- contract limits - a part can not be used on multiple contracts or all contracts
- ship limits within a contract - a part has a unique usage on one ship only within a contract for several ships
- obsolete – parts that are to be used until the inventory is depleted and will not be replaced, no procurement of an obsolete part is allowed
- system limits – parts that have a unique ship system use, i.e. cryogenic fittings, titanium fittings, conductive caulking, etc.

**DESIGN PROCESS:** In the context of Phase II, design process is the process of establishing the material and/or parts that will be applicable for use in ship design, going through all the disciplines in engineering and culminating in a documented design product (drawing or CAD model) that manufacturing can use to build the ship and purchasing can use to buy the material/parts/equipment. In particular, within the design process, is part search and selection of new parts. Selection of parts must be in concert with initial design definition.

**MODEL GROUP:** The department or function within a company that would be responsible for the graphic representation of parts/material.

**MATERIAL GROUP:** The department or function within a company that defines and controls the configuration and definition of parts/material.

**STANDARD PARTS CRITERIA:** Established attributes and parameters that are used in the evaluation of parts for determination and categorizing as either standard or non-standard. The Standard Parts Criteria is the aggregate of the specific part group criteria or criteria applicable to each unique homogenous part group.

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**STANDARD PARTS BASELINE:** Parts that have been evaluated and determined to meet the standardization criteria are standard parts and therefore constitute the Standard Parts Baseline.

**STANDARD PARTS LIBRARY:** The Parts Library is the listing or repository of standard parts (Standard Parts Baseline) and non-standard parts. It is either a manual repository or an electronic repository. The Parts Library is textual and contains the complete technical description of all parts.

Along with the textual description of a part, there exists in some companies, a graphic representation. Graphic representation can be as a CAD library part, raster image, photograph, and a picture from a vendor catalog or a sketch. Depending on a company's approach, the graphic representations of a part could be considered as part of the Parts Library or it could be a separate repository or library.

**GENERAL STANDARD PARTS CRITERIA:** The general parts criteria is established from the review of the Contract & Regulations requirements, Manufacturing & Facilities Capabilities and Procurement Considerations which drive either directly or indirectly the parts to be utilized in the design and manufacture of a ship. The General Standard Parts Criteria is applied to parts groups and the specific parts group criteria or Standard Parts Criteria is developed.

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**ACRONYMS & ABBREVIATIONS**

**ABS**

American Bureau of Shipping

**ANSI**

American National Standards Institute

**ASME**

American Society of Mechanical Engineers

**ASTM**

American Society for Testing Material

**CFR**

Code of Federal Regulations

**COTS**

Commercial off the shelf

**ECP**

Engineering Change Proposal

**EMI**

Electromagnetic Interference

**FMR**

Field Modification Request

**ILS**

Integrated Logistic Support

**NAS**

National Aerospace Standard

**NDT**

Non Destructive Testing

**NEMA**

National Electrical Manufactures Association

**PPD**

Project Peculiar Document

**R & M**

Reliability and Maintainability

**R/N**

Revision Notice (relevant to drawings)

**SARA**

Superfund Amendments Reauthorization Act

**USCG**

United States Coast Guard

**PHASE II**  
**IMPLEMENT PART STANDARDIZATION METHODOLOGY**  
**1.0 Secure Appropriate Management Approval and Sign Off for a Parts Standardization Program**

**1.1 General**

Implementation of a Parts Standardization Program must first be endorsed and fully supported by company senior management. Senior management must understand what Parts Standardization is, how it can be implemented and the projected cost savings/avoidance and endorse its implementation with the same enthusiasm as a record first quarter earning report.

**1.2 Definition:**

In order to establish a Parts Standardization Program, there must be a plan developed or designed that outlines the key events, event scheduling and resources required to implement a program. There are three scenarios in which a company would initiate a Parts Standardization Program. They are, (1) initiation by the company to avoid the proliferation of parts as a cost avoidance initiative (2) the company's customer, (contract initiated) requires a program implemented by the company or, (3) the company dictates program implementation. If company management is initiating the implementation of such a program then justification will need to be presented to that company management in order to gain final program approval. If initiation of a Parts Standardization Program is being driven by a contract or a company's customer then the process of developing a program plan, developing the cost associated with implementation and gaining program plan approval by company management would also be necessary. However, final program plan approval would be the customers' responsibility in the form of final price approval of the contract or contract change. Finally if a company makes the decision to just implement a Parts Standardization Program then the whole justification process to senior management would be eliminated either in part or whole.

Regardless of the driver for implementing a Parts Standardization Program the elements of this procedure are all applicable.

**1.3 Procedure:**

**1.3.1 Establish an Investigation Committee**

A group of individuals or an individual, depending on a company's size, shall be established for the purpose of developing a plan for defining, quantifying, implementing and maintaining a Parts Standardization Program. This group will function as an investigation committee and along with development of the plan, the committee must make the presentation to senior management in order to gain endorsement of the program. Membership on this committee will be short lived, in that the job ends with endorsement of the program. However, members developing the plan should be from the areas of the company that designates, acquires or controls parts. Above all, the committee members must have experience, understand company processes and promote the potential savings that can be realized from the establishment of a Parts Standardization Program.

In a contract initiated program the committee would still have to develop a plan and establish the cost for implementation of a Parts Standardization Program but the process of presentation to

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

senior management for approval would be changed. The need to convince senior management and foster a parts standardization culture would be replaced with just establishing the cost of implementation. The company's customer, through contract initiation, will dictate that a program will be implemented and all that remains is to establish the cost of implementation.

If a company decides and directs that a Parts Standardization Program will be implemented the need to convince senior management and foster a parts standardization culture is unnecessary. However, like the other two scenarios the process of actually implementing a program remains the same.

#### 1.3.2. Committee Tasks

As a component of the plan, the committee must develop the projected cost associated with establishing and maintaining the Parts Standardization Program versus the anticipated overall savings. The degree that this cost benefit analysis is required depends upon which of the three program initiators are driving program implementation. The decision to be made with regard to establishing a Parts Standardization Program must be business orientated and substantiated by realistic cost savings or significant process improvement. To this end the following are areas that the committee needs to investigate and quantify, to the extent necessary, to support the programs' establishment:

- Standardization savings/avoidance resulting from supporting multi contracts;  
Standard parts methodology focuses on maximum contract use for parts
- Standardization savings/avoidance from reduced parts search time;  
Parts selection to support design will be focused on standard parts with the introduction of special or unique non-standard parts being strictly controlled. The established standard parts will be more visible thereby making the part search process more streamlined and expeditious.
- Standardization savings/avoidance from taking advantage of industry material standards;  
Use of industry standard parts optimizes industry/supplier-manufacturing efficiencies of parts and reduces costs.
- Standardization savings/avoidance in life cycle costs;  
Availability and reduced parts costs after ship delivery and during normal ship life.
- Standardization savings/avoidance from increased quantity purchases;  
Reducing the variety of similar parts that need to be procured.
- Standardization savings/avoidance because of manufacturing efficiency increases;  
Make/buy analysis of parts can capitalize on company manufacturing efficiencies.
- Standardization from reduced inventory and material handling;  
Reducing the variety of similar parts that need to be inventoried and handled.

The National Aerospace Standard (NAS) 1524, a standard mentioned in Phase I, is one approach for quantifying cost avoidance and cost reduction savings resulting from standardization projects. This standard can be useful in assembling the justification for establishing a Parts Standardization Program and gaining endorsement from senior management, by identifying the potential return on investment (ROI) for the part standardization effort.

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Another component of the plan is to list the events in a logical sequence that must be accomplished from plan start-up to program implementation and maintenance thereafter, see figure 1, Program Set-up. The committee must assemble a schedule that projects the sequence of events/tasks and time frame required to accomplish each event. As an example, a notional schedule of events is provided, see figure 2, Notional Schedule. The plan and schedule must project, with realism, the resources required to accomplish each event, including the anticipated increases and decreases in manning and overall materials, (equipment/systems/software). As an example, the following is a list of events that could typically be part of the plan schedule and the accompanying sample schedule:

- Endorsement of the plan for establishment of a Parts Standardization Program;  
Time frame anticipated for establishing the plan to the point that it can be presented to senior management. The number of members needed for the Investigation Committee and the man-hours involved.
  - Establishment of the Parts Standardization Board;  
The number of members that make up the board and what departments they originate from. This includes the identification of both core (full-time) and non-core (as required) members. A man-hour estimate for the Board from establishment to program maintenance mode.
  - Development of the Parts Standardization Board Tasks;  
Time frame and anticipated man-hours of support from non- Board members.
  - Development of the Standardization Criteria;  
Time frame for development, commodity prioritization, review process and final approval.
  - Evaluation of parts and determining whether or not they are standard
  - Coding of Parts
  - Develop links from standard part textual data to the graphic part representations
  - Document processes and develop procedure that will control the whole standardization process, inclusive of the procedure approvals and implementation:
    - 1) How many procedures need to be developed? (i.e Distribution of Standardization Criteria, Creation & Distribution of Standard Parts Baseline, Process for evaluating parts)
    - 2) What kind of resources are needed to develop the procedures, man-hours and equipment, (i.e.computer systems and software)? This process will require great effort involving many man-hours not just from the Board but assistance from other areas of the company. The cost driver for this effort is the number of parts that need to be quantified and how far a company is into a contract or contracts. The committee may want to investigate which evaluation approach best suits the company.
    - 3) The time and man-hours required to review all present parts for evaluating, determining as standard and the elimination or coding of nonstandard parts. This process may be more effective when a company has relatively few parts or does not have multiple shipbuilding contracts and is not almost through the design stage of a present contract.
- For companies with a present mature contract or contracts that are nearly complete and have a large quantity of parts, the cost of evaluating the parts, all at once, can be prohibitive. It is prohibitive because it's very difficult to evaluate parts to determine compliance to standardization criteria while taking care of day to day standardization requests and/or reviews. Recognize that the requests for evaluation of parts, on a day to day basis, by the Parts Standardization Board must be effective and expeditious. The design process can not be impeded because of parts evaluation. Also the cost associated with changing drawings,

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bills of material and procurement contracts for present shipbuilding contracts must be carefully considered.

An alternative would be to accept either in part or total the parts used on a current mature contract as being standard. Then conduct the evaluation process on new contract parts and make standardization adjustments on present contracts, thereby working through the process gradually and not disrupting present contracts. It should be repeated that this alternative approach is suggested for mature designs only. The most efficient and cost effective approach to a new design is to have the part standardization process be in front of the detail design.

- Develop company wide training and education:  
Training to include employee initiation to the standardization process, expectations and responsibilities. Training and education to continue into the maintenance part of the program and exist for new employees.
- After implementation what is required for maintenance and continued awareness of the Parts Standardization Program?  
What are the man-hours and associated costs?

A final task for the committee that must be accomplished prior to the plan's presentation is to establish charging instructions for all work to be done with regard to the Parts Standardization Program. What budget platform will the program come from, overhead or directly charged to either a present contract or across multiple contracts, if they exist? It's very possible that some contracts, particularly government, have provisions for cost reduction incentives which may fund a Parts Standardization Program, either in whole or part. This is an avenue that must be pursued because it affects the business decision with regard to implementing a Parts Standardization Program in a positive way.

#### 1.3.3. Management Surveillance

Progress with development of the standardization plan should be reviewed periodically with senior management to assure awareness of commitments and to provide allowance for their comments and input to the plans' development.

#### 1.3.4. Final Management Approval

##### 1.3.4.1 Company Initiated Parts Standardization Program

At the completion of the plan, the committee must make a final presentation to company senior management in order to gain approval and support to go forward with the implementation of a Parts Standardization Program. Upon approval, senior management must communicate the plan down to lower level management with the expectations for full support and commitment from all functional areas. At this point the Investigation Committee focus would change from developing a business case for the Parts Standardization Program and gaining management approval to being a part of the process for implementing and managing the Parts Standardization Program.

##### 1.3.4.2 Customer/Contract Initiated Parts Standardization Program

As with the company-initiated plan, senior management would need to be presented with the total cost of implementing a Parts Standardization Program and approve that proposal. The difference would be that senior management approval of the plan proposal would not be authorization for



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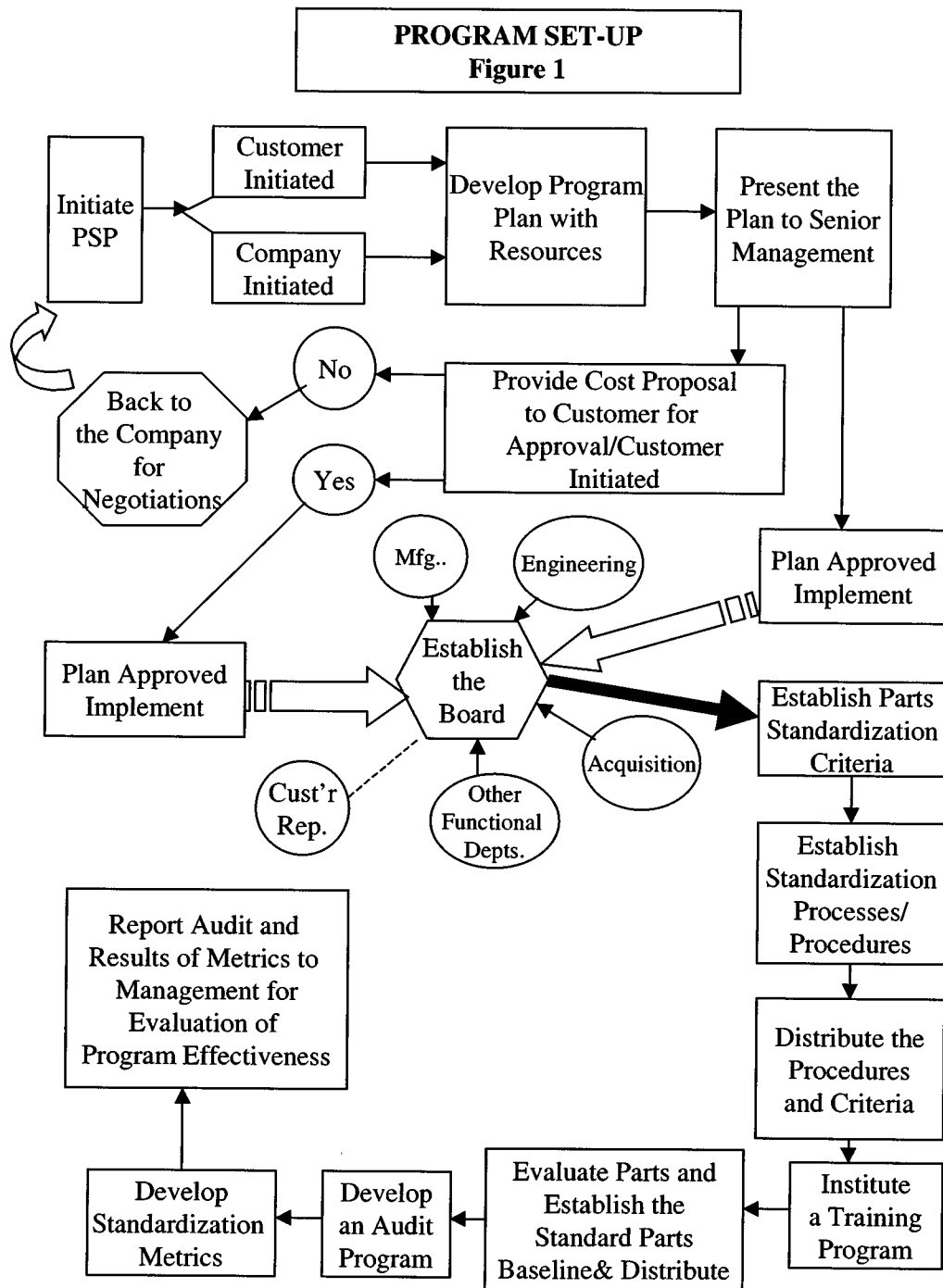
### IMPLEMENT PART STANDARDIZATION METHODOLOGY

implementation but rather for submittal to the customer for his final approval. Plan Implementation would occur only after that approval was received from the customer.

#### 1.3.4.3 Company directed Parts Standardization Program

A company directed Parts Standardization Program approval process would be abbreviated as compared to a company initiated program, if unnecessary at all. The implementation process however, would be the same as both the company and contract initiated Parts Standardization Program.

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# PHASE II IMPLEMENT PART STANDARDIZATION METHODOLOGY

Notional Schedule  
Figure 2

ID	Task Name	Duration	Start	Finish	Resource Names	January Jan	February Feb
1	Establish a Investigation Commitment	30 days	Wed 1/26/00	Tue 3/7/00	(3) - <4>		
2	Endorsement of the Plan	30 days	Tue 3/7/00	Mon 4/17/00	(3) - <4>		
3	Establishment of the PSB	30 days	Wed 5/31/00	Tue 7/11/00	(3) - <4>		
4	Develop PS Criteria	45 days	Tue 7/11/00	Mon 9/11/00	(4) - <5>		
5	Evaluate Parts Initially	75 days	Tue 9/12/00	Mon 12/25/00	(4) - <6>		
6	Evaluate Ongoing	360 days	Mon 12/25/00	Fri 5/10/02	(2) - <2>		
7	Code Parts	45 days	Mon 11/13/00	Fri 1/12/01	(1) - <1>		
8	Develop Processes and Documentation	90 days	Wed 1/26/00	Tue 5/30/00	(4) - <5>		
9	Process/Procedure Maintenance	360 days	Wed 5/31/00	Tue 10/16/01	(1) - <1>		
10	Develop Initial Training	60 days	Wed 5/31/00	Tue 8/22/00	(1) - <2>		
11	Training On Going	360 days	Wed 8/23/00	Tue 1/8/02	(1) - <1/2>		
12	Program Maintenance	360 days	Wed 5/31/00	Tue 10/16/01	(4) - <1>		
13	Auditing	360 days	Fri 6/23/00	Thu 11/8/01	(1/2) - <1/2>		

## PHASE II IMPLEMENT PART STANDARDIZATION METHODOLOGY

### **2.0 Purpose of a Parts Standardization Board**

#### **2.1 Purpose of the Parts Standardization Board (PSB)**

The purpose is to implement and maintain the parts standardization efforts of the company. Also to define what “standard” is in relation to contractual requirements (standardization criteria), measure the program effectiveness and keep company senior management and the company as a whole apprised of the program’s performance. The Parts Standardization Board acts as a “gate keeper” to prevent or control any changes to the Part Standardization Criteria and Parts Standardization Baseline or the introduction of any new part that does not meet the Standardization Criteria, without justification.

The Board manages and controls the Standardization Methodology and processes within a company. Control should not be dictatorial but achieved through a team utilizing a management process whereby the parts designated by design, procured by purchasing and used in manufacturing are those that are overall the most cost effective and contractually compliant to the company and his customer. The Board, in order to provide successful management, must be flexible so that standardization processes react effectively to accommodate change to the Program. The Program must remain cost effective and supportive of all parts users and effective enough so that it doesn’t impede aggressive design schedules and procurement plans.

#### **2.2 PSB Membership/Membership Qualification**

The selection of qualified members for the Parts Standardization Board membership is vitally important to the standardization process. The PSB should be comprised of dedicated individuals from the various functional areas of a company that designates, acquires, uses and controls parts. Board membership would be different for a small shipbuilder than it would be for a marine design company to a large full service shipbuilder. Therefore, the specifics of who exactly is dedicated and what functional areas should be represented are an individual company’s decision and responsibility.

The general qualifications for board membership are listed in Phase I, section 1.1.2, and to reiterate, they are:

- Familiarity with a least one-design/functional discipline. (i.e. Electrical, Piping, Machinery, Vent, etc.).
- Knowledge of CAD platforms and company software material control systems (if applicable).
- Strong PC skills.
- Competent understanding of the design and production environment within a company
- Experience in the company material and design change processes.

Phase I, section 1.1.2, Establish the dedicated team and appoint a leader, addresses the qualifications of the Program Manager, Team Leader and Team Members. The exact

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

qualifications would be something that an individual company would have to develop. However, the success of a Parts Standardization Program will depend upon the abilities and integrity of the people implementing and managing the process.

It should be emphasized, however that not all the members need to have all of these qualifications as long as the membership, in general, have these qualifications in the aggregate. The key is that the board, as an entity, has the expertise and authority to manage the standardization process so that the full benefits from parts standardization can be realized.

Customer representation in the form of an ancillary board member is a consideration that could benefit both the company and the customer. The customer would be intimately aware of and involved on a limited basis in the parts standardization process. Although this benefit could apply to large commercial contracts it is anticipated that the major benefit would reside with military contracts for which there is a lengthy design phase and multi-year multi-ship manufacturing period. Some examples of the benefits are;

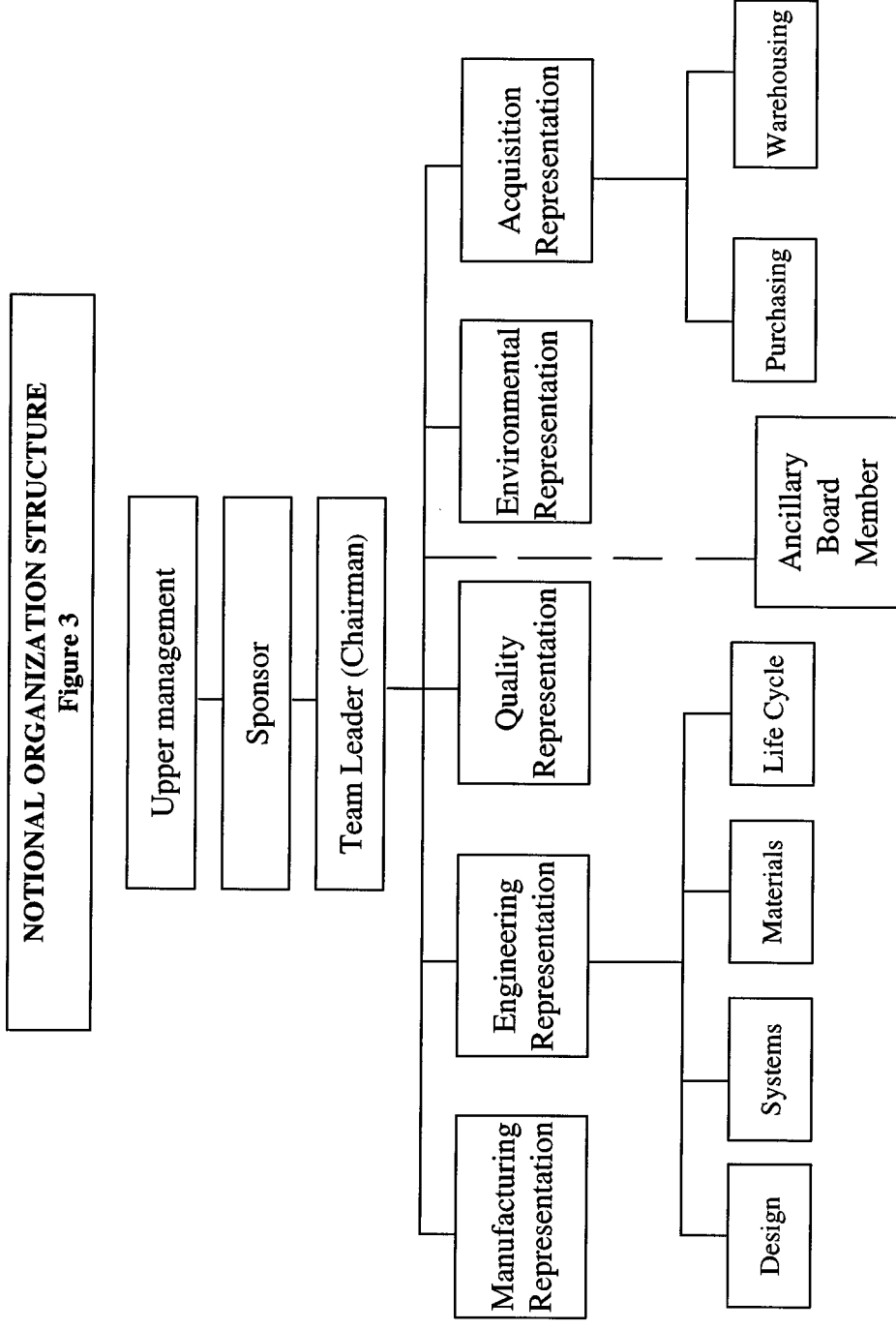
- Contract changes either in the ship design process or in a class design process and/or in the manufacturing processes. The customer knows what the company's standardization criteria is as well as the standard parts baseline and the cost benefits that can be realized by the company and his customer endeavoring to use standard parts. Therefore, when the customer either proposes a change or directs a change he is at least cognizant of the benefits that can be realized from utilizing standard parts and be receptive to their use in a change. Even when the change entails new technology or new equipment the ancillary parts involved with the equipment change out could be standard and therefore potentially mitigate the total cost associated with such a change.
- Customer input, with regard to either changing criteria or adding a new part to the baseline could provide another point of view from outside the company and be beneficial to the board.
- The representative (Navy) could interface with Navsea Technical Codes to assist with administration of change and the introduction of new technologies or material/part substitutions.

Since the investigation committee developed the plan for the Parts Standardization Program, and gained its endorsement then there would be a logical progression for the committee members in part or whole, depending upon a company's size, to be included on the PSB. The PSB core members should not be encumbered by other assignments until the board job load has reached a point whereby the responsibilities do not entail full time attention. See the notional organization structure of a Parts Standardization Program figure 3, Notional Organization Structure.

#### 2.3. PSB Authority and Recognition

The Parts Standardization Board must have the authority from senior company management to deploy the Part Standardization Program in accordance with established procedures and processes and be supportive of the company business plan.

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

#### **3.0 Establishment of the Parts Standardization Board**

##### **3.1 Procedure**

###### **3.1.1 Representation**

Logically, the individuals or individual (committee) that developed the Parts Standardization Program Plan would be instrumental in establishing the Parts Standardization Board. To this end, this committee must determine what functional areas of the company need representation on the board. The functional areas for consideration are spelled out in Section 2.0. Purpose of a Part Standardization Board

###### **3.1.2 Support for Representatives**

The management of those functional areas selected will be approached by the committee for the purpose of requesting representatives to serve on the board. This is part of the support that senior management expects from lower level management. Each functional manager needs to be provided with the Parts Standardization Board qualification requirements and general expectations. Let the functional managers decide who is most appropriate to represent the department on the Board. The committee needs to provide each manager with a schedule or time for his decision and be prepared to be flexible. Depending upon the size of the company, giving up an employee from a department to support the implementation of the Program can represent a hardship or at least an imposition. Another consideration is to utilize two or more employees, on a part time basis, from a functional department. It's not ideal and may require scheduling of committee members but the implementation of the Program can proceed. The actual work load for the Board members will vary depending upon company size, the number of parts that need to be evaluated and where the board is with regard to the time frame from program start-up to complete program implementation. Once the Program is implemented and it has matured then the board man-hours may drop off substantially. Initially, however, the recommendation for board effort should be 100% for the core team members.

This section thus far has addressed the start-up of a Parts Standardization Board within a company that would be classified, at a minimum, as large. The establishment of such a board in a small company may be significantly different. There may not be the personnel available to support a full time autonomous Parts Standardization Board. The quantity of parts may be significantly less than at a large company, which could have multi ship, multi year contracts for ships that, due to size or complexity, would generate a large population of parts. However, the basic need for establishing a Parts Standardization Board of a responsible individual or individuals who have the direction from senior management to implement and maintain a Parts Standardization Program is exactly the same as the commitment required from a large company. The Board, whether full time with multi members or one or two members and part time, or the Parts Standardization Board and Material Group as the same working body; is the key to making a Standardization Program effective and will afford the company the savings that can be realized by controlling the proliferation of similar or

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

duplicate parts. To this end, the theme and elements of Phase II are applicable, in part or in whole to all companies who desire a successful Parts Standardization Program.

#### 3.1.3 Set Back

Should the committee not get the support with regard to candidate proposal from a functional manager, then the committee needs to return to upper management for support/resolution. Delay in gaining support obviously sets the implementation of the Parts Standardization Program back and will impact start up schedules. The Parts Standardization Board is responsible for keeping the Program on schedule. Further, the Board must realize when their authority either comes into question or meets roadblocks and assistance is required. This is the first identification of need from a strong senior management commitment and the resulting PSB empowerment from this commitment.

#### 3.1.4 Program Implementation and Maintenance

Once the Parts Standardization Board has been established, a chairman must be established. This chairman could be one of the Parts Standardization Board members or someone already assigned the responsibility of chairman prior to establishing the Board. However, autonomy and the ability to make standardization decisions/policy that benefit the company as a whole without being influenced by his home functional area would be of paramount importance to an effective Parts Standardization Program. Otherwise the Parts Standardization Board chairman's qualifications would be the same as board members.

The chairman should be the manager or team leader of the Parts Standardization Program and as such report to senior management. The responsibilities of the chairman/manager/team leader are broken down into two categories, implementation and maintenance. The responsibilities and associated effort or man-hours for these two categories are different. The implementing phase of the Parts Standardization Program is intense and has great visibility. The manager/team leader has the responsibility to get a major program operational when possibly no such program has existed previously and, for the most part, there is very little experience to draw from. The maintenance phase requires that all the processes and procedures are functioning as designed, the day to day work load is accomplished in a timely manner and the audit results of program effectiveness are favorable. The responsibilities of the manager/team leader for implementation and maintenance are as follows:

#### Implementation

- Chair the Parts Standardization Board
- Available and unencumbered by other assignments as appropriate
- Develop and issue the Standardization policies
- Keep senior management apprised of the Program status
- Initiate and deploy processes and procedures for Parts Standardization Program
- Participate in the development and administration of the Program, where necessary
- Coordinate activities of specific departments and/or individuals in support of ongoing board activities



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- Schedule and convene all Parts Standardization Board meetings as required
- Ensure that methods are in place to measure the effective results of the Parts Standardization Program after it has been implemented
- Develop company wide training and education
- Mediate discussions and problems/conflicts/resolutions.

#### Maintenance

- Continue to be focused on maintaining an effective program
- Keep senior management apprised of the Program status  
This could be accomplished by publishing the results of audits conducted thereby assessing the effectiveness of procedures in place to control standardization
- Maintain and/or revise processes and procedures to reflect enhancements to the Program
- Maintain company wide training and education efforts that have been established. This process may only entail scheduled refresher training sessions except in the case of new employees
- Schedule and convene all Parts Standardization Board meetings as required
- Review changes to present contracts and/or anticipated new contracts for impact to the Parts Standardization Program; In the case of changes to existent contracts, the Board must have as much notice as possible in order to make adjustments to either the standardization criteria or baseline. This allows the Board to provide cost input to change cost and to support the schedule for change. In the case of a new contract, the Board may have to develop either a new standardization plan or possibly modify an existent one. It's all part of being proactive and supporting new company business.
- Proactive either taking the lead or in conjunction with Engineering and/or Purchasing in seeking new products/parts/material that are being developed in the vendor community. These new products could have the potential of effecting design parameters, manufacturing processes or material costs. The PSB and Engineering must be effective in assessing new products and determining whether or not the company or their customer would benefit from the product use. If new products are, after evaluation, determined to be beneficial to the company then the Board would be responsible for adding it to the baseline, the library and coding it for appropriate use and coding the part replaced or obsolete for non- use.

## PHASE II IMPLEMENT PART STANDARDIZATION METHODOLOGY

### **4.0 Tasks of the Parts Standardization Board**

#### **4.1 General**

There are two basic efforts associated with a Parts Standardization Program. The first effort pertains to the establishment and implementation of the Program. This particular effort defines program start up, standardization criteria and all the process development that needs to take place in order to determine what parts are standard and how these determinations are made and communicated across the company. The second effort defines how the Program maintains standardization and measures performance and effectiveness once established. As an overview of the program tasks see figure 4, Parts Standardization Board Tasks.

#### **4.2 Procedure**

##### **4.2.1 Develop Standardization Criteria**

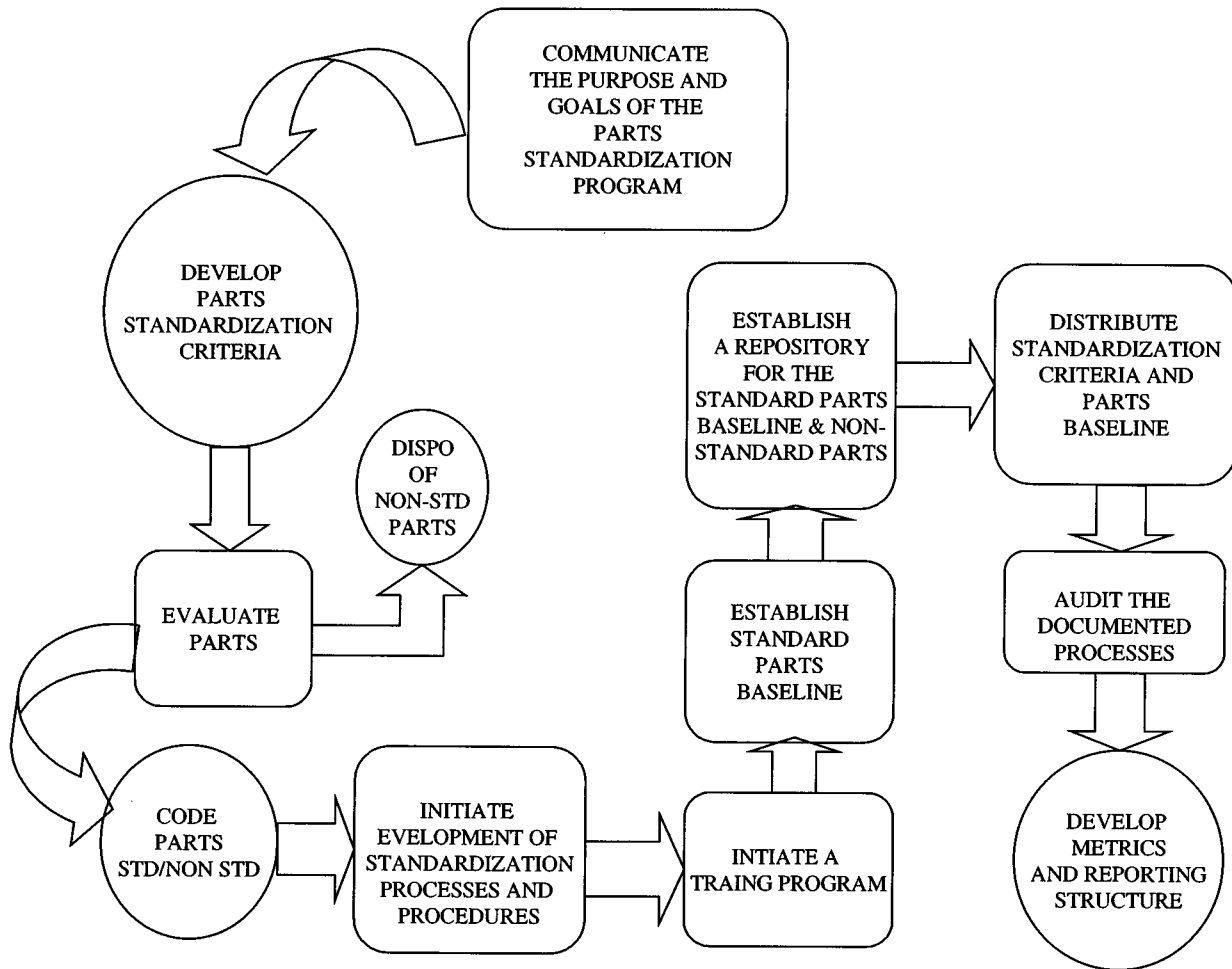
Standardization criteria are the established attributes that are used in evaluation of a part for determination and categorizing as standard or non-standard. Standardization criteria must be developed and established by the Parts Standardization Board. The criterion is the heart or baseline of the Parts Standardization Program. Development of criteria will require input from each functional area of the company as represented by the board members. Standardization criteria will be dynamic in that they change depending on the vendor market place, shipbuilding contract requirements, the company's manufacturing capabilities and ever evolving technologies. Standardization criteria established at the start of a shipbuilding program would undergo changes as the program matures. The Board must be able to react to change that affects criteria and keep it current and supportive of the shipbuilding program throughout its duration.

Standardization criteria may be applicable across numerous contracts. The differences between one shipbuilding contract and its end product (surface combatant, commercial freighter, tugboat, passenger) to another, may drive the board to establish standardization criteria that is contract specific. There may be some overlap between contracts with regard to criteria but not enough so that one set of criteria works for all contracts. Additionally, there may be changes between ships in one contract (surface combatant w/o helicopter capabilities vs surface combatant that does) that will cause the criteria to be hull specific in total or in part. These situations need to be considered when developing standardization criteria.

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### PARTS STANDARDIZATION BOARD TASKS

Figure 4



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#### 4.2.2. Part Standardization Criteria Consideration

The following is a suggested list of considerations that must be reviewed when the Parts Standardization Board develops the standardization criteria. These considerations are general and applicable either in whole or in part to any company regardless of size or parts population. They are not all the attributes that must be considered in developing criteria but are intended to effect a thought process that should be utilized in developing criteria that fits the unique requirements of any company.

- Contractual requirements:

Those that are relevant to material/parts for present contracts and anticipated business. Components of contractual requirements, which either directly dictate or indirectly influence the parts to be used in a shipbuilding contract, are, as examples:

- |   |  |
|---|--|
| 1) Material Specifications              | Military/Government Specifications,(i.e. Mil-S-1222, PPD 805-5959353, QQ-N-281, etc.) and Commercial Specifications, (ASTM A106, ABS 43, AISI 1018, etc.                             |
| 2) Dimensional Specification–           | Military/Government, (Mil-F-20042, MS17830, FF-S-92, etc.) and Commercial Specifications, ( ASME/ANSI B16.5, SAE J512, NEMA, etc.)   |
| 3) Ship Specifications                  | Contract design and manufacturing requirements for a ship, ( overall contract technical requirements)  |
| 4) Contract Drawings                    | PPD, (Project Peculiar Document), NavSea, Commercial Marine Design Agent,Conceptual Ship Drawings  |
| 5) Customer directed suppliers or parts | Propulsion Systems, Cargo systems/pumps, Weapons Systems, Steering Systems, etc.   |
| 6) Contract Testing Performance         | (ship speed, list, incline, etc.), R&M, (Mil-STD- 470), ILS,Life Cycle, NDT, Mil-STD- 271)   |
| 7) Contract Certifications              | Shock, Noise, Vibration, EMI, USCG, ABS  |
| 8) Process requirements                 | Welding, Military(Mil-Std-278), Commercial(ASME Section IX)  |
| 9) Environmental Regulations            | Hazardous Materials, (CFR 355), SARA Title III   |
| 10) Quality Assurance Requirements      | Military Specifications (Mil-Q-9858, Quality Assurance Program, Mil-I-45208, Quality Control), Commercial Specifications, ( ISO 9001, Quality Program and ISO 9002, Quality Control) |

- Life Cycle and Spare Parts:

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Requirements that either because the contract requires it or because it's a significant element of the cost of buying and maintaining a ship. As part of the design process and subsequent part selection, life cycle, spare parts and logistical considerations can significantly impact the trends in reducing the manning costs of ships today, in particular, Naval combatants and also commercial ships.

- **Contract requirements:**  
They are criterion for parts evaluation. There may be instances whereby parts are similar in technical scope or may only be different with regard to material specification effectivity dates.  
Consideration should be given to standardizing on only one of several available similar parts, even if the company has to effect a contract change to support standardization on the one part. Part cost savings and reduction of similar parts may be significant enough to justify the cost of changing or modifying an existent shipbuilding contract.
- **Manufacturing impact:**  
Is the part cheaper to buy rather than manufacturing it in house or vice versa, considering the machinery involved and personnel training required? What new processes and/or procedures must be put in place or eliminated by the standardization of one part over another? Special coatings for instance on steel plates could be required to enhance or eliminate a unique manufacturing process.
- **Feedback:**  
From production/manufacturing with regard to manufacturing process changes that have impact to parts criteria. This feed back may occur well after a shipbuilding contract has matured and as a result of a contract change to ship design that may be significant or minor. The board must be able to react and make the appropriate standardization criteria changes.
- **Part availability:**  
Utilize the vendor community's expertise and available information with regard to what is standard in the vendor community. Consider the vendor's lead-time to buy, is it acceptable and meet the company's procurement schedules? Take advantage of the general favorable part price and availability because it is standard to the vendor community, unless or course the shipbuilding contract requirements drive a company to special and unique parts. Marine applications tend to be specialized due to the adverse environment and ship missions and therefore parts can be unique.
- **Contract diversity:**  
How many contracts can a part be used on? Elimination of the variety of parts can represent significant savings in procurement contracts for like parts over time. Possibly combining standard part requirements with other marine related companies could represent even more savings.
- **Environmental impact:**  
Review the present and potentially new environmental and hazardous material regulations and requirements. Paints, solvents and adhesives are just a few parts/material in which technical regulations affect standardization in a dramatic way. This is a standardization criterion that will be forever changing.

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- **Handling and storage:**  
Review the part handling and/or storage requirements. Can savings be realized by reducing warehousing and handling equipment?  
Cryogenic pipe fittings, as an example, is a part that requires significant handling and warehousing processes that can potentially overshadow the benefits to manufacturing.
- **Historical part usage:**  
Parts may be in inventory with a very low usage requirement. Consider substituting with a part that facilitates higher usage or has a higher pedigree.
- **Military requirements/specifications**  
Compare the military part requirements to candidate COTS parts. Can significant part savings be realized by using commercial parts and does the shipbuilding contract provide for use of COTS parts?
- **Contract or customer changes:**  
Review contract or customer driven changes that affect parts, standardization criteria and potentially the standard parts baseline. What course of action or what processes must be in place so that the board can react to these changes in a timely manner? The board must be flexible enough and the standardization process dynamic enough to adjust to these changes and still support the day to day standardization functions with regard to design and manufacturing needs and schedules.
- **Part shelf-life:**  
These particular parts require specific receipt and usage control, which will impact standardization criteria.

#### 4.2.3. Establish Parts Standardization Criteria

After development of the Parts Standardization Criteria, the Parts Standardization Board must issue them across the company as the “standardization criteria” by which all parts are to be evaluated against, both present and new. Criteria, as developed by the Board, are those part attributes that represent the most cost effective and contractually compliant parts, to the company. Any change which affects criteria and ultimately parts or the Parts Baseline has a potential of affecting the cost of parts to a company, either adversely or positively. Therefore, such changes to the criteria and parts must be communicated effectively throughout the company. Section 8.0, Distributing Standardization Criteria and the Standard Parts Baseline Procedure, further addresses the distribution of the Standardization Criteria.

#### 4.2.4. Evaluation of Present Parts

With criteria for parts standardization established, all present parts contained in the company’s library or system can be evaluated against the criteria and determination made as to whether each part is now standard or not. In order to accomplish these tasks in a systematic manner, parts should be broken down into homogenous or logical lots that could be called commodities. (i.e valves, pipe fittings, plate, pipe, etc.) These lots, or groups of like material, lend themselves to quicker evaluation of whether they should be standard or non-standard. This categorizing or development of commodities of similar parts expedites the standardization effort because criteria application would be similar.

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As an example, evaluation of a valve then plate and then an electronic component is too diverse as compared to evaluating all the valve commodity then all the plate commodity etc. Evaluation by commodity is systematic and focused and therefore facilitates predictable scheduling of the overall standardization process for present parts. This will aid a company in achieving their standardization goals with regard to implementation time and will be of benefit if a company is having difficulty standardizing on some of the part types.

After the establishment of part commodities, the groups of commodities or like parts need to be prioritized. The commodities for which a greater potential for standardization exists should be evaluated first. Another consideration of part commodity priority is based on when part commodities are required in a design process (such as structure and piping required early, and electrical and habitability required later) The progression would go down to those commodities that either would yield the least benefit from standardization or will require the greatest amount of evaluation time. Evaluation of present parts must be accomplished as soon as possible so that the benefits of the standardization program can be realized as soon as possible, impact present shipbuilding programs the least and provide the greatest benefit and parts savings on future shipbuilding contracts. Once the evaluation is either complete initially or progress is nearing completion then the library of standard parts or repository needs to be completed either in parallel with the evaluation process or subsequently. The list of Standard Parts or Standard Parts Baseline needs to be disseminated throughout the company, as soon as possible. Once this is accomplished then all parts users will know what the accepted parts baseline is and that the use of non-standard parts without justification and approval of the PSB will not be allowed. See figure 5, Parts Selection Process.

It is the optimum approach to evaluate parts when time or the present business climate permits. This promotes the logical progression of grouping like parts, evaluation and subsequent development of parts baseline is, of course. However, evaluation of parts when a company is in the middle of or late in a shipbuilding contract/s with prospects of a new shipbuilding contract/s simply doesn't allow the logical evaluation process as outlined in the previous paragraphs. Consideration should be given to establishing the parts presently used or some part thereof as the accepted standard. The time that it would take to evaluate all parts for mature contracts or multi-contracts could prove to be too disruptive and costly. By accepting the present parts as standard and then gradually segregating out those parts that are outside the criteria, over time, then the establishment of a Standard Parts Baseline that is aligned with the Standardization Criteria can be achieved. This puts the Parts Standardization Program in place and ready to support a new shipbuilding and/or design contract at the ideal time, in concert with emerging design, so that the benefits of standardization can be realized to the maximum extent.

As a result of the evaluation process there will be parts that are categorized as non-standard but may need to be maintained in a company's inventory/data base. Disposition of these particular parts must be contemplated and determination made whether or not

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they have use and should be retained or disposed of. Examples of why non-standard parts should be retained would be;

- to support company facility maintenance requirements,
- to support industrial applications/contracts (non-shipbuilding or core business applications),
- to support company manufacturing tooling, i.e material handling, rigging components, measuring instruments, hand tools, machinery, etc..

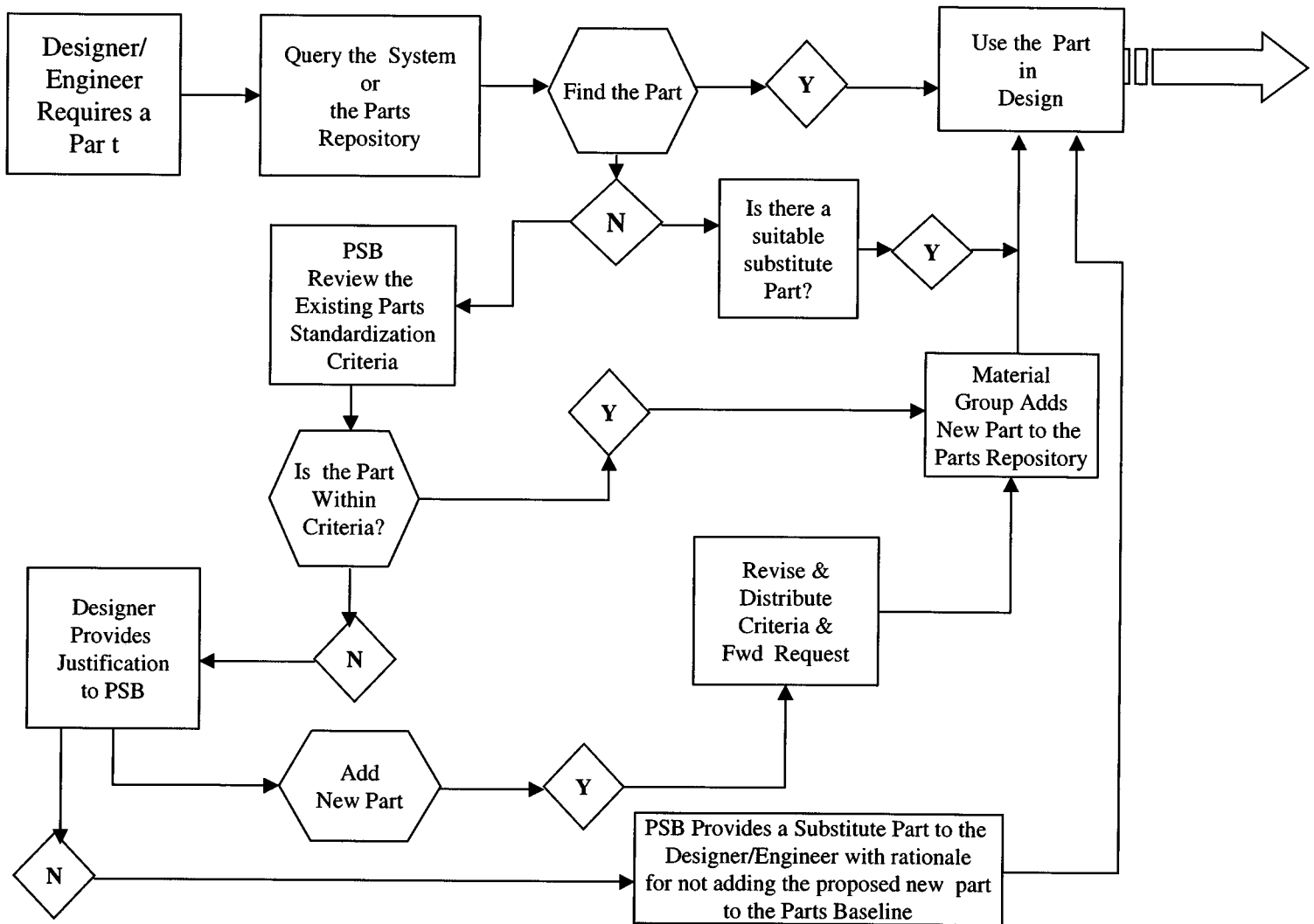
Non-standard parts that have no future use should be disposed of and provisions implemented to prevent any future procurement of these particular parts. However, the Board also must consider the options available for mitigating the disposal cost of non-standard parts. Generally this can be accomplished by either finding opportunities to use these particular parts or continue the use of the non-standard parts before implementing the replacements until the inventory of non-standard parts is eliminated or reduced. Even disposal of non-standard parts needs to be planned in order to maintain the cost effectivity of the Parts Standardization Program.



# PHASE II IMPLEMENT PART STANDARDIZATION METHODOLOGY

## **PARTS SELECTION PROCESS**

**Figure 5**



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#### 4.2.5. Coding of Parts

Once a part has been evaluated and determined to meet standardization criteria, it is updated to become a standard part and is now part of the Standard Parts Baseline, therefore it's usage must be controlled. If a company has multiple shipbuilding contracts and, as a result, multiple standardization criteria then the control of parts usage is more difficult but very important. The recommended method of control is part coding. Part coding can be either alpha or numeric or a combination thereof. Company wide establishment and understanding of the meaning of the code and usage of each part in accordance with the code definition is key to maintaining an effective Part Standardization Program. Part codes, once established become an important component of part technical definition. Coding of parts can narrow part usage to a very specific end use or expand to a variety of uses, if required. Further, part of the code can denote contract usage and expanding the code can also denote other part attributes, such as preferred or allowed usage parts, a nonstandard part but with a very narrow usage requirement or a part that is either undergoing or supporting research and development but is non-standard. Part coding can be beneficial in part search in that the part repository can be searched in a focused (by code) area and reduce search time.

As an example, assume that a company has a commercial and a Navy design or shipbuilding contract, manufactures an industrial product line and maintains its own equipment and facilities. There are more than one-standardization criteria and the parts code is part of the technical definition. (Please note that this is only an example of a coding methodology. More or less complicated coding schemas will be required dependent on the business processes to be supported in the existing implementing company.

The parts code could be a four-digit number applicable to each contract.

P	A	R	R
Navy	Commercial	Industrial	Maintenance

R – Restricted

P – Preferred

A – Acceptable but non-standard

C – Contract unique, use wyz contract only

O – Obsolete no uses allowed

Example:

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A part code of PARR means that the part is preferred for the Navy contract, can be used for the commercial contract, could not be used on the industrial work or for maintenance.

R	A	O	O
Navy	Commercial	Industrial	Maintenance

A part code of RAOO means that the part is not to be used on the Navy contract is acceptable for the commercial contract, obsolete for the Industrial work and maintenance.

It should be noted that these are just a couple of examples of coding. Each company needs to review their particular parts and contract situation and develop parts coding that best suits their unique requirements and system capabilities.

However, part coding and the part repository, which will be addressed in the next paragraph, must be flexible enough to facilitate the usage of a particular part on a contract for which it is not standard and has in fact been coded so that it can't be used. Situations always arise whereby this particular part, with modification, must be used on a contract or ship which the part code does not permit to meet a manufacturing schedule. Part coding and the part repository must be flexible enough to allow one-time exceptions, with PSB authorization, but does not allow the exception to become the rule.

#### 4.2.6 Part Repository

Parts that have been evaluated and determined to meet the criteria for standardization constitute the Standard Parts Baseline. Parts that do not meet the criteria for standardization are not Standard Parts Baseline but because of specific contract requirements or other unique usages will reside in the parts repository. Therefore, there are two categories of parts, standard and non-standard, and they, and all their associated data, must be put in the parts repository so that they are visible to all part users across a company.

Generally there are two types of repository medium; manual and electronic. Regardless of which medium is selected for use by a company, it has to be big enough to contain all

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

parts, both standard and non-standard with the associated data, and provide some level of recall or part search capability. Therefore, the Parts Standardization Board must select which medium best fits the needs of the company.

#### 4.2.6.1 Manual Repository

The manual repository will require that each piece of part data in the two categories be listed in a paper-based catalog. Generally, there would be an identifying number for each part. Each identifying number must contain the complete and accurate technical definition of the part. This definition would typically include, but not be limited to the following:

- Technical definition, inclusive of relevant material, design and dimensional specifications.
- All performance and testing criteria.
- Quality Assurance, provisioning, logistics, life cycle, reliability and maintainability and any company specific requirements.
- Photograph or graphic depictions of a part if necessary.
- Part Code

Technical definition of parts and material and the overall management of the definition is a function of a company's overall product design and therefore the responsibility of the engineering organization. The part definition must be in enough detail to support all the user needs. As an example, if the part definition is either insufficient or incorrect and the buyer buys the parts in accordance with the documented technical definition, it may not suit the needs of manufacturing. Incorrect or insufficient part definition will impact design/engineering, especially in the areas of part dimension, as only one example.

Parts need to be broken down in to lots of functionally similar parts or as mentioned in paragraph 4.2.4,Evaluation of Present Parts, commodities. An example of commodity break down might be as follows:

<u>Material Type</u>	<u>Title</u>
1	Doors, Hatches, scuttles, etc.
2	Rigging Components
3	Vent Fittings
4	Laundry, Barber Shop, Galley, Messing & Scullery Eqt.
5	Pipe,Tube & Hose
6	Valves, Ferrous
7	Valves, Non Ferrous
8	Fittings, Pipe Joining, Ferrous
9	Fittings, Pipe Joining, Non-Ferrous
10	Flanges
11	Steel Plates & Sheets (except Cress)

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### IMPLEMENT PART STANDARDIZATION METHODOLOGY

- 12 Castings & Forgings
- 13 Paint, Paint Products
- 14 Fuels, Lubes, Grease
- Etc.

This breakdown makes search and/or selection easier and quicker, especially with a manual repository. As an example, a pipe designer may need a particular type of pipe in order to accomplish a piping design. He would typically search the pipe commodity to select the right part. He would not have to search the entire catalog of parts to find the particular pipe required, just the pipe commodity. Further, each commodity should be broken down into levels of commonality. An example of a pipe commodity further broken down into a lower level of commonality could be as follows.

<u>Mat'l Type</u>	<u>Level</u>	<u>No</u>	<u>Description</u>
<u>5</u>	02		<u>Material</u>
		01	Steel
		02	Corrosion Resistant
		03	Chromium Molybdenum
		04	Brass
		05	Copper
	03	06	Copper Nickel Alloy
			<u>Weight Class</u>
		02	Sched 5
		04	Sched 10
		11	Sched 80
		21	Cl 200
	04	22	Cl 700
		26	Ty K
			<u>Finish</u>
		01	Plain
		02	Galvanized
		03	Chrome Plated
		04	Finish N/A
	05		<u>Construction</u>
		01	Seamless
		02	Welded
		03	Extruded

Another example, the piping designer needs to utilize in his design a piece of seamless, plain, schedule 80, corrosion resistant pipe. He would search the manual repository, commodity 5 catalog with the aid of the commonality number in order to reduce the search time. His first level of commonality would be 02 and number 02 or corrosion resistant steel. Next level would be 03 and number 11 or schedule 80; the next level

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would be 04 and number 01 or plan and finally level 05 and 01 or seamless. The commonality number would be 5- 02- 11- 01- 01.

For control purposes there needs to be a master set of catalogs of all the commodities. This master set must reside in a controlled area with limited access and also be administrated by one functional area. The area or department might logically be in engineering but the Parts Standardization Board needs to verify that control is being maintained. This verification can be accomplished during normal Quality audits with the results relevant to these particular control procedures being forwarded to the Parts Standardization Board. In a small company it may be appropriate for the Board to conduct such audits as necessary. It is important that control is maintained of the part repository data and that someone or department is held accountable. All areas of the company that use parts need a copy of the catalogs and an efficient distribution process set up to control the copies and subsequent revisions thereby providing assurance that all parts users have the latest parts technical definition.

#### 4.2.6.2 Electronic Repository

This repository medium is certainly the most prevalent in today's world of electronic data and computerization. The Standard Parts Baseline and each part technical definition/data would simply reside in electronic databases. The data base product or system to be used is something that a company would have to contemplate and either procure or utilize existent information systems already available within a company. As with all electronic repositories, consideration must be given to size or data storage capabilities. The system has to provide all parts users with the capability to obtain their unique data in a prescribed format, sort or table. The system needs to be powerful enough to be fast with queries, user friendly and be able to support growth. Access to the Standard Parts Baseline must be available to all parts users, necessitating multi-computer terminals with real time read only capability.

Control of Standard Parts Baseline data, as is the case with the manual repository, is essential to establishing and maintaining an effective Standardization Program. Changes to the baseline data must be accomplished by a very select group of employees. As stated previously, the group that would generally be tasked with changing the database would be engineering with verification of control changes being accomplished by the Parts Standardization Board.

The electronic repository lends itself to better control of parts data, in general, than the manual process. The designer's visibility of parts can be limited to a particular contract, design discipline or even a particular area of ship design, if necessary. Non-standard parts with very limited or specific usage parameters can be retained in the data base but with part coding and the ease with which part data can be controlled electronically, there is assurance that the use of these nonstandard parts will not be proliferated or used in the undesirable applications. The ability to search and find a particular part is much enhanced over the manual repository. The creation and capturing of a part's

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classification schema in the modern electronic part repository will provide a user-friendly, standardization supportive methodology to easily find the required part.

#### 4.2.7 Standardization of Major Ships' Components/Equipment

Phase II has addressed, thus far, the standardization of parts. Parts are generally single components of a ship: such as; paint, pipefittings, plate, valves, bolts, wire, shapes. There is a type of part that is more complex than raw stock which comprises a major portion of the ship's cost. These parts are classified as major components or equipment. Examples are:

- Main Engines ( steam/gas turbines, diesels)
- Reduction Gears, electric drives
- Steering systems
- Shafting & Propellers
- Refrigeration Systems
- Pumps
- Boilers/Reactors
- Weapons Systems

The significance and type of equipment will vary from small ships, large ships, commercial and military.

Even though Standardization of major equipment is not the central focus of this Parts Standardization Methodology but the methods outlined in Phase I & II could be applied. The standard engine, gears, weapons systems, etc. would be the type of part/component specified at design concept and ultimately by the customer. The standard equipment with regard to the company that only builds ships would be customer directed.

To change major ships' equipment after design and manufacturing has started is extremely costly and unless driven by a catastrophe (the major equipment supplier goes out of business) would not normally be a viable option. However, there are numerous less complex ship's components for which a change after commencement of ships' construction could result in a cost savings. Examples would be; pumps, electronic equipment, galley equipment, unitary refers, etc. The criteria in which alternate equipment would have to be evaluated against might not be the same as parts criteria, but the evaluation process would be the same. An example of criteria that a new pump or pump system might be evaluated against is:

- Impact to ship interface from the standpoint of;
  - piping
  - foundation
  - weight
  - physical space
- Performance characteristics
- Operational costs
- Warranty

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- Company's financial status
- R&D necessary for a new design
- Life Cycle Cost
- Cost of delay and/or redesign to the ship to support the equipment change

Proposed equipment changes could very well meet the standardization criteria associated with major equipment but still be prohibitively expensive with regard to actual change costs. Cost of change, in itself could be the biggest factor or criteria to be considered with major equipment change. Some of the elements that significantly impact these changes are:

- Cost of drawing changes
- Cost of tech manual changes
- Cost of provisioning changes
- Cost of any Life Cycle change
- Cost to the company for the evaluation associated with the change

Standardization has limited application to major equipment. A company that implements a Standardization Program could focus their attention on standardizing non-major parts initially and as the Program matures and the standardization infrastructure solidifies, Board attention could be focused on the standardization of major ship's equipment. However, there is no rule with regard to which parts singularly or complex (major equipment) should be evaluated first. It's a unique company decision.

#### 4.2.8. Communication of the Purposes and Goals of the Parts Standardization Program and Distribution of the Standardization Criteria and Parts Baseline

##### 4.2.8.1 Communication

After senior management has endorsed the Parts Standardization Program then the purpose and goals should be communicated across the entire company. Possibly the presentation utilized by the Investigation committee to gain senior management endorsement would suffice as the initial communication. Timely communication thereafter of the program's progress with regard to implementation must be accomplished. These particular communications would be the responsibility of the Parts Standardization Board. As an example, the following is a list of key events in establishing the Standardization Program and therefore constitute the elements of the Program to be communicated across the company. Further, these communications must impress upon company employees the importance of the program to the company and that the company and senior management fully support the Program. Employee understanding and support are key to program success and effectiveness. Examples are:

- Establishment of the Parts Standardization Board membership supported by membership qualification requirements and rationale for appointment to the board.
- Establishment of the Parts Standardization Board chairman and his responsibilities.
- Anticipated infrastructure between the Parts Standardization Board and the functional areas of the company.



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- Schedule of projected principal events leading to full implementation of the Parts Standardization Program. Although this schedule is flexible, initially it keeps the company as a whole apprised of the implementation progress.
- Establishment of processes and procedures that govern the program. These processes and procedures will be dynamic initially but, as the program matures, they will stabilize and undergo less change. This particular communication allows the part users to become acquainted with the standardization tools and procedures on a gradual basis. It also provides opportunity for timely input to the formalization of the Parts Standardization Program by employees.
- Develop, maintain and distribute the standardization procedures, once the process of evaluating and establishing standard parts begins.

#### 4.2.8.2 Distribution, Standardization Criteria

The criteria by which parts, both present and future, will be evaluated and determination made, as either standard or non-standard parts must be distributed across the company. Users of parts and in particular designation of parts (engineering and designers) must know what constitutes a standard part and the process for initiating evaluation of a new part. See Section 8.0, Distributing Standardization Criteria and the Standard Parts Baseline Procedure, for distributing standardization criteria. The Parts Standardization Board must develop the process and subsequent procedures that will define how new parts are evaluated and determined to be standard, see Procedure 5.0, Part Standardization Board Operating Procedure. The procedures must be distributed upon program startup and every subsequent change or revision. Distribution should be to all the functional areas of the company that designates, acquires, uses and controls parts.

In particular the engineering and purchasing departments have a more significant role in introduction of new parts. As an example:

- Engineering  
All Managers and Supervisors of the functional areas of Engineering who designates parts in a design product must be very familiar with standard parts, the evaluation criteria and the process for introducing new parts into a design.
- Purchasing  
Although a buyer typically procures parts to an established engineering technical definition, (part number) there will be occasions whereby a buyer is privy to new products/parts in the vendor community that represent a potential material cost savings to the company. If the buyer recognizes a potential new part/product that may meet the standardization criteria then he will initiate a detailed evaluation by the Parts Standardization Board in accordance with the established process.
- Focused Teams  
In aggregate, teaming of engineers and procurement personnel for the purpose of better or enhanced management of part technical definition and procurement. (i.e mechanical, electrical, hull, etc.)

#### 4.2.8.3 Distribution, Standard Parts Baseline

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The list or repository of parts that constitutes the Standard Parts Baseline, paragraph 4.2.4, Evaluation of Present Parts, and the list of parts that are non-standard with unique specific usages and any subsequent revisions to the lists must be visible and available across the company. The Parts Standardization Board must develop a process and procedure for distributing this data whether the media is manual or electronic. The distribution process must assure the Parts Standardization Board that all users of parts are receiving the latest configuration of the baseline, its verifiable and outdated renditions are not available nor being used. See Section 8.0, Distributing Standardization Criteria and the Standard Parts Baseline Procedure.

#### 4.2.9 Training

After approval of the Parts Standardization Program, an ongoing training seminar needs to be set up to acquaint the company as a whole with the program's goal, the benefits and the plan for implementation. Training should be accomplished at more than one point in the program implementation. The larger the company the more the need. One training session throughout the implementation process may be too comprehensive and therefore not be as effective as multiple training sessions. If a company has a training department then training could be accomplished by them with input from the Parts Standardization Board. If a company is small then the actual training could be accomplished by the Board or designee. Other windows of opportunity for training, would be after the standardization criteria has been developed and parts have been evaluated or procedures written and distributed that control the standardization process. Training, however, is a process that should exist, to some degree, as long as standardization exists within a company. Continual periodic training/awareness is required to ensure that standardization is maintained as people move in the company and/or the standardization process remains dynamic. Training and the frequency thereof would be at the discretion of the Board. Training might be an effective corrective action when audits for program effectiveness reveal that procedures are either not being followed, or due to change, have become less effective at controlling the processes.

#### 4.2.10 Auditing

In order to determine if the standardization program is effective, regular audits of the processes and procedures must be accomplished. Recognize that auditing the standardization process should be conducted sometime after the program has been implemented and the development of standardization procedures and subsequent revisions has stabilized. Continued scheduled auditing of the program assures that it continues to accomplish the goals originally set forth. There are two parts to the auditing process. One is to determine if the standardization process, as a whole, is adequately documented by procedures so that process functions are consistent and effective. The second is to determine if the standardization procedures are being followed as written. The auditor should walk through each standardization procedure, in order to determine whether or not it actually controls a process or processes to the extent necessary. Another consideration is, are the employees who utilize the procedure/procedures familiar with its requirements, all the required records and are the records/enclosures properly filled out, in their entirety? Are all peripheral procedures that affect standardization or

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standardization procedures effective? Objective observation by the auditor is crucial because those people actively involved in a procedure and its use often are not cognizant of its possible shortcomings, they are too close! It's imperative that each procedure reviewed is being followed, as written. Every procedure and the process/processes that they control must be in complete agreement. If not, the procedure must be revised to reflect the exact sequence of events accomplished in a process and all required records are complete.

Another opportunity that avails itself to assessing the performance of the standardization process is through the Material Discrepancy reporting. Any company that employs a quality program will assess all discrepancies and in this case those related to material to determine the cause of discrepancies and implement correction. If, for instance, a part description is incorrect, it's procured and discovered to be incorrect at receipt then corrective action will have to be implemented to correct the part and correct the cause. In this instance the correction as to cause would lead to investigation of the part database and why it's incorrect and what needs to take place to prevent recurrence. Correction keeps the processes within a company (and in particular the standardization process) in check and operating as designed.

Most companies in the shipbuilding business maintain a quality program either of their own volition or because their shipbuilding contracts require it. The auditing process is an element and a requirement of a Quality Assurance Program. Auditing may be accomplished by the quality department or the functional departments (Engineering) themselves for the processes and procedures that they have cognizance over. Generally, the Quality Department would conduct overall audits of departmental processes within a company in order to ascertain each departments' ability to effectively audit themselves and their processes and procedures. All audit results would ultimately go up to senior management but those results having to do with parts standardization would have to include the Parts Standardization Board.

#### 4.2.11 Metrics and Reporting Techniques

The success of a Parts Standardization Program from inception to initial completion and throughout the program's life needs to be quantified. Whether the Parts Standardization Program was initiated by the company or the company's customer or the company is small or large, assessing the effectiveness of the program is imperative if the program is of any importance at all. In order to measure the effectiveness of the program it is essential that there is a starting point or known present status of performance in quantitative or measurable terms. In essence how many parts does a company have, use or have in their databases presently at the point of time that the Parts Standardization Program is implemented. What is the time frame or schedule for evaluation of these parts and determining their compliance with the established standardization criteria? Initial effectiveness of the program would be to determine if the number of parts evaluated against the total parts population was in accordance with the original schedule set forth at any point of time during the schedule. If the part evaluation effort is not in accordance with the schedule then corrective action needs to take place to get back on schedule.

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Once the initial evaluation of parts has been completed the metric associated with reporting that particular progress would also end. However, the Parts Standardization Board would need to determine what other areas and/or processes in the Standardization Program need to be monitored on a regular basis in order to assess the overall program effectiveness. The following are examples of metrics that could be used:

- Total population of parts that have been reviewed which fit the Parts Standardization Criteria. This total population would vary depending on the contracts in place and/or new business. This number and/or in particular the variances which may exceed a predetermined range or percentage may be an indicator of a problem in the standardization process that may need further review and brought under control.
- Parts in the review process after the initial parts review. This metric may be of benefit in planning the continual manning requirements for support of the Parts Standardization Program.
- Obsolete Parts. What is the population and what are the costs associated with disposal?
- What is the total population of Government/Customer furnished parts? This would be beneficial in determining the resources required to manage a GFM program.
- The goal of the Standard Parts Baseline or upper limit. What is the anticipated growth in the Standard Parts Baseline considering new contracts or with flight contract changes in an existent contract and impact to the upper limit?
- Part growth due to change in an existent contract but not wholesale flight changes, i.e. Engineering Change Proposals, ECP's, Drawing Revision Notices, RN's, Field Modification Request, FMR's, etc. Change or contract outgrowth would have a correlation to increase business within a either fixed price contract or cost plus contract. This outgrowth in parts would have a different meaning depending on the type of contract and therefore would be an important metric.
- Total parts (probable new) which have not been evaluated and therefore can not be procured, holding up procurement.
- Ascertain the average cost to add a new part to the Standard Parts Baseline and the cost associated with maintaining it. This cost metric would be a tool or a factor to be considered when new parts are being considered for inclusion in the Standard Parts Baseline. There may be instances whereby it is not cost effective to add a new part to the Baseline. It's imperative that a company has the ability to make this assessment.

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#### **5.0 Part Standardization Board Operating Procedure**

##### 5.1 Purpose:

The purpose of this procedure is to define the Part Standardization Board (PSB) Process. Further, it defines the responsibilities and interaction requirements of the Board, Engineering and Procurement functions.

##### 5.2 Responsibilities:

###### 5.2.1 The PSB

- Creation, distribution and maintenance of the Parts Standardization Criteria
- Creation of the Standard Parts Baseline and Library and the administration of the Standard Parts Baseline.
- Review and evaluation of existent parts within a company in order to determine compliance with the Part Standardization Criteria.
- Cost analysis, review and response to questions or request/justification regarding the addition of new parts outside the Criteria to the Standard Parts Baseline, changes to the Baseline, changes to the Criteria or changes to the technical description of parts in the Standard Parts Library.
- Part location and assisting the functional areas of the company with location of or part search and controlling the part duplication in the Library.
- Establish and maintain documented procedures to control the processes associated with accomplishing the goals of this procedure.
- Auditing the standardization procedures and measuring their effectivity.

###### 5.2.2 Engineering

- Assist in the creation of the Standard Parts Library and maintain it thereafter.
- Addition of new parts to the Standard Parts Baseline which fall within the Parts Standardization Criteria
- Ensure only baseline parts are used in ship design
- Assist the Board, as required, with part evaluations and cost analysis

###### 5.2.3 Procurement

- Apprise the Parts Standardization Board and Engineering of vendor changes that affect parts procurement and/or changes in vendor part numbers or part technical definition.
- Apprise the Parts Standardization Board and Engineering of new products/parts available in the market place that may be advantageous to the company.
- Support the Parts Standardization Board, as necessary, with parts cost analysis.

##### 5.3 Procedure

###### 5.3.1 Establishing Parts Standardization Criteria

The Board shall utilize the resources within the company in order to develop the Parts Standardization Criteria. Those resources would be a combination of the functional areas

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within a company; that designates, acquires, use and control parts. Initial development of the PSC is involved and can be lengthy but criteria are essential to an effective Parts Standardization Program. Once established, the criteria would be the responsibility of the Board to maintain and adjust as the company business changes and/or parts change. It would be the responsibility of the Board to document the process of developing and maintaining the PSC with a procedure. See Procedure 6.0 for guidance in developing the Parts Standardization Criteria.

#### 5.3.2 Evaluation of Present Parts

In Section 4.0, Tasks of the Parts Standardization Board, paragraph 4.2.4, Evaluation of Present Parts, the process of evaluation of existent or present parts within a company is outlined. The outline is varied depending on a company's unique characteristics, i.e size, type of contracts, parts population, maturity of shipbuilding contracts, etc. The specific approach to be employed by a company for the evaluation of present parts must be developed by the company and be tailored to fit a company's unique schedules. The decision to either evaluate all parts and put those determined to be standard into the standard baseline or use the parts presently used in a mature contract, either in part or whole, as the baseline will be driven by a company's own urgency to get the baseline established. The Board, however, shall either be responsible for parts evaluation or, depending on a company's size and parts volume, will utilize other functional areas of the company for assistance but the Board manages the evaluation process.

At the completion of the parts evaluation process the parts that meet the standardization criteria are the standard parts and constitute the Standard Parts Baseline. These baseline parts will be the priority parts to use in any company design product. Therefore, the Standard Parts Baseline must be distributed throughout the company, see Section 8.0, for the Distribution of the Standardization Criteria and the Standard Parts Baseline.

All baseline parts must be in a repository that at least contains the complete part technical description and could also contain the textual as well as the graphic depiction of every part. The repository or Standard Parts Library in conjunction with the Standard Parts Criteria must be distributed throughout the company initially and at every revision or change thereafter. The Board shall develop the process and procedure that control distribution.

In parallel with the evaluation process, all parts with the exception of those parts that will be disposed off will need to be coded. Coding is the essential control necessary to preclude standard parts from being used on contracts or in applications that have been determined at evaluation to be unallowed or not the optimum use. The Standard Parts Library will contain many parts that may be baseline on one contract or application but not across all contracts or applications. Parts coding is applicable regardless of the type of repository employed by a company. The Board would be responsible for developing a procedure that defines the codes and the correct application of each.

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The tasks of developing the Standard Parts Criteria, evaluation of the present parts population, developing a part usage code and finally the development of a parts repository or Standard Parts Library are different functions but not necessarily ones that occur in a distinct progression. These tasks may occur in parallel with some degree of overlap. Finite or specific part group criteria may undergo some changes before a particular part group is evaluated for standardization. As part of the evaluation process, usage codes will need to be developed and applied to the part technical description. Once the first part is evaluated and coded for usage the need for a repository is immediate and therefore the Standard Parts Library must have been established and ready for part data loading. The Board will have to manage these tasks so that the process is accomplished in concert.

The final step in the establishment of standard parts is to create a link between the “standard” parts text and descriptive data and the graphic representation of them. A graphic representation can be considered as a CAD Library Part, A Raster Image, a Photograph, a Picture from a Vendors Catalog or even just a Sketch. When a part becomes obsolete, non-standard, or is no longer available, that information needs to be communicated to a Modeling Group or functional area within the company that takes care of the graphic representations. The graphic representations used by design must always be an accurate reflection of the descriptions contained within the Standard Parts Library. This process can be either manual or electronic depending on the capabilities of the implementing company. If the process is electronic, the graphic representation of the non-standard part must be coded as non-standard in the same fashion as the textual version was. Optimally these two activities should take place at the same time. Ideally, it would be most beneficial if the textual information, and the graphic information about a particular part is handled by the same group. If the process within the company is manual, the distribution and notification process which was used to notify all of the change in textual information should be expanded to include graphics. It is vital to ensure that this control process be established and maintained so that the text and graphic representation of parts are always synchronized with each other.

#### 5.3.3 Addition of New Parts

A request for a new part can be initiated from a variety of sources within a company but generally from the Engineering discipline, in particular the Materials Group/Engineering and/or Design. This request shall be initiated only after the Standard Parts Library has been searched either by the area that needs the new part or with the assistance of the Material Group or the Parts Standardization Board. Every attempt shall be made to utilize other existent standard parts first rather than request a new one and to assure that the new part is not a duplicate of an existent part.

The Materials Group will review the request and make a determination if the part meets the Standardization Criteria. If it does, then the new part will be added to the Standard Part Baseline and the Standard Parts Library will be revised. The requester shall be notified as well as the Parts Standardization Board. The revision of the Library will need to be disseminated throughout the company. The frequency of Library revisions and to

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whom within the company are issues that a company will have to solve themselves in order to support their own unique needs.

The Materials Group will notify the Modeling Group or the function within a company who maintain the part graphic representations so that a graphic representation can be created for the new part. The new representation will be distributed to the requester, the Materials Group and the Board.

When the Materials Group determines that a new part requested does not meet the Standardization Criteria then the request and all justification for it's addition to the Baseline will be turned over for to the Parts Standardization Board for their review and disposition. The Board will advise the requester and the Materials Group of their disposition and the rationale for either granting the request or not. It should be emphasized that the Board's disposition of new part requests must be timely. It is unacceptable that design or the manufacturing process be held in abeyance waiting for the Board's part disposition. The responsibility of controlling the Standard Parts Baseline and the Parts Standardization Criteria also carries the responsibility for the Board to be a team player with regard to the supporting the design and manufacturing process and schedule. Because of this immediacy requirement, it may be advisable to co-locate the Parts Standardization Board with the new part requesters (design or engineering). If the part is to be added to the baseline as standard, then the Parts Standardization Criteria will have to be revised to reflect the new part attributes. If the part is to be added to the Library but as non- standard then it shall be coded to limit its use.

Review of a potential new part that doesn't initially meet standardization criteria should be focused on the following areas, but not be limited, to the following:

- Does the requested part represent an improvement in the design?
- What is the frequency of use?
- Is the requested part contract driven with no alternatives?
- Are there savings to be realized by adding the part to the Library, enough to offset the cost of change?
- What is the best decision for the entire company?
  - This is the decision phase where the PSB leader must rely heavily on the knowledge and experience of the individual PSB members. These members, in turn must rely heavily on the subject matter experts within their own home organizations to assist in formulating the right decision. These and other pertinent questions must be asked and answered. The PSB must render its decision in a timely fashion to avoid undue time constraints on the design and procurement processes.
  - The decision of the PSB is ruled by the standardization criteria. All decisions by the PSB relative to adding or not adding new parts are final unless the technical capability of the requested part application is detrimental to the specific platform's mission. It will be decided by the PSB Team Leader as to whether the applicable standardization criteria requires modification or the permission to utilize a non-



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standard part should be granted. This course of action is a very rare occurrence, but the Part Standardization Program should be able to support it, when required.

-If the PSB agrees to add a new part to the Parts Library, as a result of a Designer or Engineering request, the Standard Criteria, Part Codes and Graphic Representation must all be updated and distributed as previously explained to ensure that the latest information is always available.

The Parts Standardization Board shall document the process/es developed for the requesting, evaluation, deposition of new part requests and existent part evaluation with a procedure/s. This procedure/procedures must accurately reflect the process and must be followed as written. Because processes change the procedure/s that control them will be dynamic.

#### 5.3.4 Changing Parts and/or Technical Definition

Generally changing a part that is baseline is difficult because of the impact to the baseline, graphic representation or model, the drawings wherein the part is depicted, the manufactured product, warehouse or inventory and procurement contracts. Types of rationale that could promote the need to change standard parts in the baseline are changes in part configuration, new technology, and difficulties with the supplier. Therefore, any part change must be reviewed by the Materials Group and the Board. Approval of such a change must be based on cost effectiveness to the company unless there is no alternative to the change. In either case approval must be by both the Materials Group and the Parts Standardization Board, if separate entities. If the Material Group and the Parts Standardization Board are actually one entity, then only one approval is required.

Changing the technical definition of a standard part must be done judiciously because its impact can be the same as changing a standard part. Generally, changing the technical definition of a standard part is for correction purposes but deletion or additions of the definition can also be accomplished. However, all present uses of the part to be changed must be reviewed for adverse impact, mitigation of impact must be planned and a cost analysis accomplished in order to determine cost effectiveness to the company. As stated above with regard to changing parts, the Material Group and the Parts Standardization Board, either as separate entities, or one, must approve the change.

The Parts Standardization Board shall document the process with a procedure for part change or technical definition change. Any revisions to the Library must be distributed throughout the company so that only the latest parts data is available.

#### 5.3.5 Deletion of Parts

As with part changes, deletion of a part must be reviewed by the Material Group and Parts Standardization Board for validity and impact to the same areas as with part change. If the part is found to be unnecessary then it should be coded so that it will not be picked for use in any new design application. If the part is in inventory then with proper coding it will remain in the Library until the inventory is depleted. After depletion the part data can be removed from the Library.

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The Parts Standardization Board shall document the process of part deletion with a procedure and revise the Library and distribute it throughout the company.

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### **6.0 Procedure for Development of the Parts Standardization Criteria**

#### **6.1 Responsibility:**

The Parts Standardization Board shall develop the Parts Standardization Criteria, maintain it and distribute it throughout the company.

The Engineering/Materials Group shall assist the Board in the development of the Parts Standardization Criteria, as requested, if the two groups are separate.

#### **6.2 Definition:**

Parts Standardization Criteria - are the established attributes that are used in evaluation of a part for determination and categorizing as standard or non-standard?

Enclosure (1) Notional Diagram for Development of Parts Standardization Criteria

#### **6.3 Procedure:**

##### **6.3.1 Requirements**

The first step in developing Standardization Criteria is to determine what requirements exist that will ultimately drive part standardization criteria. As pointed out in Section 4.0, Tasks of the Parts Standardization Board, there are many factors to consider when developing criteria, but they generally fall under the following categories and therefore are the areas that should be reviewed initially.

##### **6.3.1.1 Contract & Regulation Requirements**

Review each shipbuilding contract & regulation for impact either direct or indirect to parts. What is the specific contract & regulation impact and what is the aggregate impact of all contract & regulation requirements? Direct impact would be contractual or regulation direction from the customer with regard to specific equipment, material or parts to be used in the design and manufacture of a ship/ships. As an example;

- Major ship components by manufacture and model number
  - Main Engines
  - Gears
  - Steering Systems
  - Weapons Systems
- Material by specification, (Military vs Com'l)
  - Steel Plate, Shapes
  - Pipe Fittings
  - Coating Systems
- Parts by manufacturer and Model Number
  - Circuit Breakers
  - Pumps, motors
  - Unitary Refrigeration

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Indirect impact would be contractual & regulation direction with regard to ship characteristics and performance criteria. As an example;

- Ship dimensions, (Plate and shape size to accommodate the company's manufacturing capabilities vs market place availability)
- Horsepower - shaft size and material, bearings
- Ship's Mission - merchant, passenger, combatant
- Performance requirements – shock, noise, vibration, EMI
- Equipment requirements – capacities, fluid medians, operating pressures, temperatures, ship configuration
- Life Cycle Requirements

#### 6.3.1.2 Manufacturing and Facilities Capabilities

Review the company's manufacturing capabilities with regard to equipment and process flow, material handling and warehousing capabilities. Determine if the company's unique capabilities impose restrictions or provide opportunities with regard to potential part usage and part criteria. As an example;

- Limits with regard to processing plate (storage, retrieval, cleaning, cutting)
- Limits with regard to painting
- Limits in material handling capacities
- Area weather/climate affect on manufacturing

#### 6.3.1.3 Procurement Considerations

Review the procurement strategy presently employed by the company for achieving overall best value in the procurement of parts. What affect will a new shipbuilding contract have on the strategy? Are there synergies between present and potentially new contracts that could affect the overall cost of material? What are standard parts in the vendor community and could the company utilize and benefit from these standard parts?

#### 6.3.2. Development of Criteria

The Board must review the requirements of the general categories, (Contract & Regulations Requirements, Manufacturing & Facilities Capabilities, Procurement Considerations) and determine which requirements either directly or indirectly affect the parts or drive the parts to be utilized in the design and manufacture of a ship. These particular requirements constitute the General Parts Standardization Criteria. Now the Board must determine how the General Parts Standardization Criteria applies to each part group, (i.e piping components, electrical components, hull components, etc.) and from there develop the specific part group criteria. This criteria may be applicable across all contracts or it may be contract specific but it is the starting point for the task of developing the criteria that applies to part groups or lots of homogeneous parts. (pipe, piping components, wire, paint, plate, etc.) The aggregate of the specific part group criteria constitutes the Parts Standardization Criteria. However, it is the specific parts group criteria that is used by the Board to evaluate parts within a group and determine

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whether or not they are standard. Enclosure (1) is a notional diagram which outlines the process for developing the Parts Standardization Criteria.

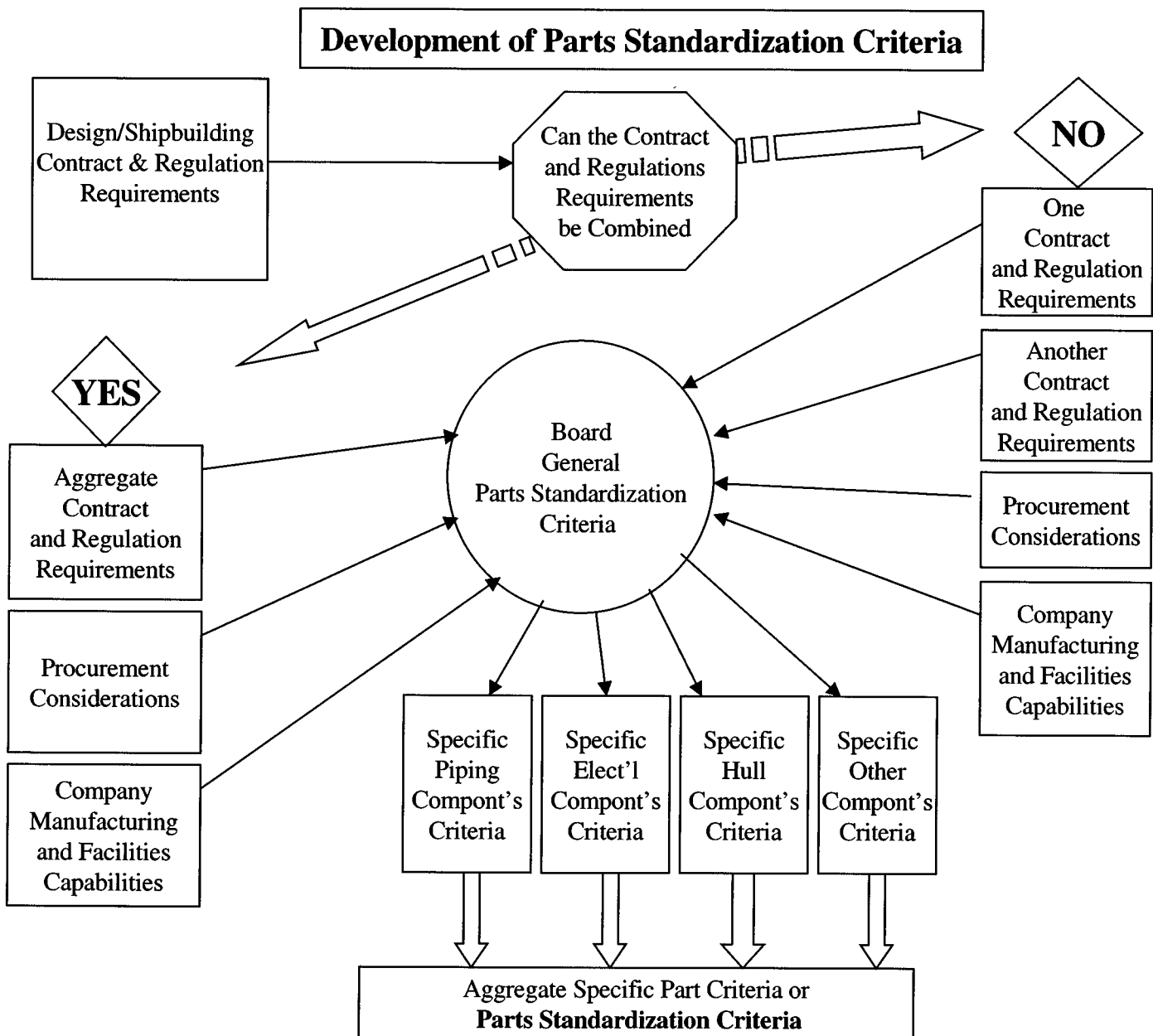
Developing the General Parts Standardization Criteria, the Parts Standardization Criteria and the evaluation of the specific part group parts are not necessarily distinct functions whereby each one has to be completed before another can begin. There will be overlap. The development of specific part groups may be underway prior to the complete development of Parts Standardization Criteria and possibly the General Parts Standardization Criteria. The correct approach is the one that best suits a company's own unique business plan.

#### 6.3.3 Documenting Processes

The Board must document the processes with procedures that they have utilized in developing the Standard Parts Criteria, which will be utilized in changing criteria and distribution of the criteria throughout the company.

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**Enclosure 1**



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### **7.0 Establishment and Maintenance of the Standard Parts Library Procedure**

#### **7.1 Purpose:**

The purpose for this procedure is to define The Standard Parts Library and its role within a Parts Standardization Program. This procedure will identify the basic requirements and tasks for establishing the Library, and the maintenance and distribution thereafter.

#### **7.2 Responsibility:**

The Parts Standardization Board shall have overall responsibility for all activities associated with The Standard Parts Library. Any additions, changes or deletions to items contained within the Standard Parts Library will be conducted under the cognizance of the Parts Standardization Board and its established processes and procedures. The Materials Engineering Group (when a separate entity from PSB) for the company will revise and distribute the Standard Parts Library but the decision process relative to additions or changes to material descriptions shall rest with the PSB.

#### **7.3 Definition:**

The Standard Parts Library is the listing of all parts utilized by a company, both standard and non-standard. The Library contains all parts with their complete technical part definition. Each part has a unique alphanumeric identifier used to segregate it or get it into common groups. As an example, the information listed against each alpha-numeric identifier would consist of, but not necessarily be limited to, such things as:

- Military Specification or Standard Drawing
- Color, size, shape, dimensional information.
- Testing requirements, performance data
- Vendor Part Number(s), lead time

The Library is the one place or repository in the company where all parts can be found to support design or whatever use needed by the company. Whether electronic or manual the Library shall be set up to facilitate easy and expeditious part search. The Library, especially if it's electronic must be robust enough to contain all the appropriate part data and facilitate expeditious retrieval of the data and in user prescribed format. In addition, the links, electronic or otherwise, should be maintained between the textual information of a specific part and its associated graphic representations.

#### **7.4 Procedure:**

##### **7.4.1 Establishment of a Standard Parts Library**

After the establishment of the Standard Parts Criteria by the Parts Standardization Board but prior to the evaluation of existent parts within a company a decision has to be made with regard to where parts data and the accompanying graphic representation will reside. Section 4.0, paragraph 4.2.6, Part Repository addresses part data repository, both manual and electronic.

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The part data repository or Standard Parts Library can be either manual and paper or electronic. A company may have an existent repository that with modification can support an effective Standardization Program. Establishment of a Standardization Program may drive a company to either buy or develop a new repository or Library and eliminate their present repository. Whatever the situation the repository or resultant Library must be robust enough to support all the required functions of the Program. An effective Standard Parts Library is a key element of a Standardization Program.

With the establishment of a repository or Parts Library, it is imperative that procedures be developed to document the processes utilized in adding or deleting parts to the Library, changing part data and maintaining and distributing the Library. Additionally, these procedures must define responsibility for all the functions outline in the procedures. The development of these processes should be a combined effort of the Parts Standardization Board and Engineering.

#### 7.4.2 Presentation of Part Data

In conjunction with establishing the type of Standard Parts Library to be utilized by a company, the Board must establish how data will be presented to any user of the Library. How much textual and graphic data is needed per part in order to adequately define each part. As an example:

- Material and Dimensional Specifications
- Test Requirements and Reports or Certifications
- Physical Condition or Treatment Requirements
- Hazardous Material Considerations
- Referenced Technical Drawings/Manuals
- Packaging and Preservations Requirements
- Life Cycle Requirements
- Marking requirements
- Usage Preference (coding)

The orientation or configuration of part data in the Library will have impact on expeditious part search capabilities and retrieval of part data in various formats and queries. Presentation of part data is important to all Library users in a company but also logical, consistent and succinct data presentation to a company's supplier, through procurement contracts will minimize misunderstanding and reduce the receipt of incorrect parts.

#### 7.4.3. Management of Change

Once the Standard Parts Library has been established it is current at only one point. That point is after the Standard Parts Criteria has been established, the parts utilized by the company have been evaluated, the part data has been loaded into the Library or parts data repository and the complete Library has been distributed initially throughout the company. Any change that affects parts and the Library after this point, ( i.e add new part, deletion of parts, change part data) must be accomplished in accordance with



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prescribed processes and documented by procedures that assures that the Library and it's data are current and that the latest revision of the Library is available to all Library users.

Management of change to the Standard Parts Library will be under the cognizance of the Parts Standardization Board. The actual tasks associated with maintenance of the Library will be accomplished by Materials Engineering/Engineering. As addressed in Procedure 5.0, all additions of new parts to the Library that do not meet Standardization Criteria must be reviewed and approved by the Board. If the Board approves an addition or if the proposed new part meets the standardization criteria then the Materials Engineering Group would develop the new part data presentation, the graphic presentation and add them to the Standard Parts Library. It's imperative, however, that Materials Engineering would be responsible for assessing the benefit of adding a new part to the Library that does meet the standardization criteria. Further, changing parts the technical definition or deleting parts must be processed as outlined in Section 5.0,Part Standardization Board Operating Procedure. The responsibility for reviewing rationale for these particular changes would be a joint function of the Board and Materials Engineering.

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### **8.0 Distributing Standardization Criteria and the Standard Parts Baseline Procedure**

#### **8.1 Purpose:**

To provide guidance of establishing and documenting the process of distributing the Standardization Criteria and Standard Parts Baseline.

#### **8.2 Responsibility:**

The Parts Standardization Board is responsible for distribution of the standardization criteria throughout the company.

The Engineering Department or Materials Group is responsible for the distribution of the Standard Parts Baseline throughout the company.

If these two entities (Parts Standardization Board and The Engineering Department or Materials Group) are combined, then the responsibility for distributing the Standardization Criteria and the Standard Part Baseline resides with the combined group.

#### **8.3 Procedure:**

##### **8.3.1 Manual Distribution**

**8.3.1.1** Develop a distribution list for the Standardization Criteria and Standardization Parts Baseline. Although the distribution for each list could be similar they would not be identical. The Standardization Criteria itself would be relatively small as compared to the Parts Standardization Baseline. The repository for the Baseline or the Standard Parts Library would be quite voluminous. This library could be paper based and therefore recipients of it should be kept to a minimum, because it could be so voluminous. It may be more advantages to distribute the baseline to standard locations rather than distribute it to departments or individuals. Users of the Library would simply go to the standard location in order to use it. Maintenance of the baseline will require diligence and control. Both of which could be managed by an assigned individual or individuals who have a specific task to keep both the criteria and the library current either at department or standard locations. Poor maintenance of the Library renders it out of date and useless with every change thereafter.

##### **8.3.1.2** Document the processes with a procedure or procedures for:

- Establishing who should be on each distribution list.
- How changes are made and communicated for each list.
- Establishing assurance that each recipient on each list receives each change.
- Disposition of or annotating of previous revisions (marked information only, as an example) of the Standardization Criteria and/or Standardization Parts Baseline so that

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there is assurance that only the latest renditions of the criteria or baseline part item is being used.

8.3.1.3 Develop and document a process for auditing the distribution process and procedures for the criteria and the parts baseline to assure that the process and procedures are effective and being followed as documented.

#### 8.3.2 Electronic Distribution

8.3.2.1 Assess the capabilities of a company's electronic data system. Distribution of the Standardization Criteria, because it is a small database as compared to the Parts Standardization Baseline, can be accomplished with a data system of minimal capacity. However, the baseline at initial issue could be so voluminous that it may exceed the capacity of a company's data system. If this is the case, then initial distribution of the baseline may have to be manual with distribution of changes accomplished by the electronic data system, via electronic mail.

8.3.2.2 If the data system is robust then electronic distribution of both the Standardization Criteria and the Parts Standardization Baseline can be accomplished. Both the criteria and baseline could be put into a system Intranet thereby providing access to both databases by anyone in the company.

8.3.2.3 Although anyone can have access to the Intranet within a company, consideration should be given to whom, in particular should have access. With a manual distribution of the criteria and baseline only those on distribution get this data but this is not the case with electronic distribution. There may be personnel within a company who should not have access to the databases because of company confidential reasons. Therefore a distribution list for both databases must be developed for electronic distribution.

8.3.2.4 Additionally, consideration must be given to the configuration control of both databases. There are several considerations that must be reviewed and determinations made.

- First determination must be made with regard to who is going to have access to the databases and have authorization to revise or change them.
- If retention of the data prior to subsequent revision of the databases is a necessity and then how is this retention accomplished. The methodology for this retention within the data system along with retrieval must be developed and formalized.
- Although data has been addressed thus far in a general sense, the parts baseline data, in particular would be as a minimum textual but could also include graphic representations of parts. In order to support CAD, both textual and graphic representations for each part used in a ship design would have to exist.

8.3.2.5 Document the processes of distribution, retention of data bases and configuration management of data with procedures.

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8.3.2.6 Develop and document a process for auditing the electronic distribution process.

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**PHASE III**  
**DEPLOY METHODOLOGY**

## PHASE III DEPLOY METHODOLOGY

### **Introduction**

This Phase will address the basic steps or mechanics to be used in deploying a Parts Standardization Program. This deployment can be used by any Ship Design or Shipbuilding Company, regardless of company size or type of ship design or manufacturing contract. This Phase will not address the specific approach for deployment in any one functional area of a company, it is intended, however, to provide the basic approach for deploying an overall Parts Standardization Program.

To emphasize again, final implementation or successful deployment of a Parts Standardization Program is contingent upon the premise that the Company and Senior Management want a Parts Standardization Program and intend to support it.

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### **3.1 Manpower/Resources/Budget Requirements**

#### **3.1.1 Establishment of the Parts Standard Board Chairman**

The first step that must be taken by a company in order to deploy a Parts Standardization Program is to establish the chairman for the Parts Standardization Board. The Chairman of the original Investigating Committee, addressed in Phase II, could be the Chairman of the Parts Standardization Board. It was the intent, in Phase II, for the Investigation Committee Chairman to just transition to the Board Chairman, after approval for the implementation of a Parts Standardization Program. This particular individual would have the most Standardization experience, initially as it relates to his company. However, changes within a company may require that another individual be appointed Chairman. Whatever the case, appointment of a qualified Chairman with endorsement from senior company management is essential for the successful implementation of an effective Parts Standardization Program.

#### **3.1.2 Establishment of the Parts Standardization Board**

The first task of the Chairman of the Parts Standardization Board is to establish the Board. He will have to decide if the Investigation Committee members will be sufficient for Board membership or if new personnel will be required on the Board, either in part or whole. The Board Chairman will be responsible for seeking and gaining approval of personnel from the functional departments within the company that should be represented on the Board. This is a critical responsibility because without qualified members the Part Standardization Program will suffer. Transfer of qualified personnel to the Board from various functional areas or departments of the company can represent a hardship to the area or department losing the personnel. This task of acquiring Board personnel can be a test of senior management's commitment to implementing a Parts Standardization Program. Expedient establishment of a Parts Standardization Board is crucial to the Boards' ability to deploy the Plan and meet Plan schedules. Therefore the Chairman must recognize when delays are being experienced in obtaining Board personnel and take appropriate action. See Phase II, paragraph 3.1.2 for more details with regard to this particular type of set back

To reiterate, qualifications for Board membership and the Board Chairman are addressed in both Phase I and II. Success of the Parts Standardization Program will hinge on qualified board members and therefore, the qualifications listed in the previous Phases could be used as guide for personnel selection.

Finally, once the Parts Standardization Board has been established, the Chairman must communicate this fact throughout the company along with the specific membership.

#### **3.1.3 Review of the Parts Standardization Program Implementation Plan**

The first task of the Part Standardization Board will be to review the Parts Standardization Program Implementation Plan that was developed during the implementation phase of the Parts Standardization Program, see Phase II. The purpose for which is to ascertain if the Implementation Plan is current and accurate with regard to

## PHASE III DEPLOY METHODOLOGY

manpower, material resources and schedules and therefore would be sufficient as the Plan for Deployment or The Deployment Plan. Changes within the company could have occurred from the time that the Implementation Plan was initially developed and approved to the time for deployment of the Plan. These changes could make the Plan inaccurate and therefore, seriously impact its successful deployment. Briefly, the following are examples of change that could potentially affect the original Implementation Plan:

- Company ownership change
- Financial stability changes
- Key personnel changes
- Business plan changes
- Company facility changes

Further, depending on the extent and magnitude of Plan change, it may become necessary to submit a revised Implementation Plan or The Deployment Plan to senior management for another approval. If this is the case, the Board must facilitate an expeditious Plan approval, since any delay in Plan deployment, at this point, can adversely impact the timely full implementation of the Parts Standardization Program. In the final analysis, the Parts Standardization Board has to have a Deployment Plan that is as accurate as possible, at start up. The expeditious and effective implementation of a Parts Standardization Program requires it.

### 3.1.4 Deployment of the Plan

The Parts Standardization Board has the responsibility for deploying the Parts Standardization Program in accordance with the current and approved Deployment Plan and all its associated schedules. However, the Plan is not finite. Changes to this Plan, Program goals and objectives are inevitable and therefore must be effectively managed by the Board in order to mitigate any expansion of the Deployment Plan schedule. Effective, communication of the intent, objectives and philosophy of a Part Standardization Program, the Deployment Plan and subsequent revisions, throughout the company is crucial to the Programs' success and is the responsibility of the Parts Standardization Board.

### 3.1.5 Maintaining Control of the Part Standardization Process and Program

As the Board progresses through the Deployment Plan and its tasks, they must be cognizant of the need to develop processes and procedures that are necessary to document and control the standardization process and maintain an effective Parts Standardization Program. Additionally, most Shipbuilding and Design Companies maintain a Quality Program and all such programs, to some extent, require that procedures be developed in order to control a process to the extent that the process is predictable and repeatable. Therefore, the Board must initiate and manage the development of all such processes and procedures. Many of the standardization procedures will need development in parallel with the deployment process, while other procedural needs will become apparent as the deployment process matures.



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All procedures developed and subsequent revisions, relevant to Standardization and the Program must be communicated throughout the company and be controlled from a configuration standpoint. The Board would be responsible for both communication and configuration control.

### 3.1.6 Training and Education

Training and education is key to company wide understanding of why the Parts Standardization Program was initiated, the projected benefits and how those affected will be expected to perform their functions in the future. Training and education is critical to a successful and expeditious deployment and maintenance of a Parts Standardization Program.

Therefore, an initial training and education program must be developed by the Parts Standardization Board almost as soon as the Parts Standardization Program is deployed. The training and education process should run nearly in parallel with the deployment of the Parts Standardization Program. However, as the Parts Standardization Program goes through change and matures, the training and education process must also change in order to assuring that the understanding of the standardization process by participants, who will be most active, is current. Also the training and educational process will have to include specific processes and procedures that are directed at new employees. Assuring that a new employee has an expeditious and basic understanding of the Parts Standardization Program is as essential as training a current employee.

Depending on company size the Parts Standardization Board may not be directly involved in the training and education process but will be responsible for its overall effectiveness.

### 3.1.7 Shipbuilding Industry Organizations

The Parts Standardization Program and in particular the Parts Standardization Board must become active in the National and International Standards community. The followings are examples of National and International Standard Committees or organizations:

- SNAME – Society of Naval and Marine Engineers
- Maritech ASE –
- ASTM – American Society of Mechanical Engineers
- ANSI – American National Standards Institute
- ISO – International Organization of Standards

Although participation is not as essential at the onset of the Parts Standardization Program it must be recognized as important by the Board and participation scheduled after the Parts Standardization Program has been deployed. Participation, whether it is in the form of membership in the various organizations or being on mailing lists and receiving information from them, is essential to being an internationally informed Parts Standardization Program. This participation in these organizations can potentially afford many opportunities to the company. As examples:

- Awareness of new products and material in which the shipbuilding and design industry could benefit.

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- Awareness of standard parts used in the vendor community that could be utilized by the Shipbuilding Industry and potentially contributes to the reduction of material costs to a company.
- Awareness of new technologies and business opportunities available both nationally and internationally.
- Awareness of new manufacturing methods in which a company could benefit.
- Opportunities to influence standardization decisions and policies within the National and International Standards Community.
- Promotion of Part Standardization methodology to a wider marine industry audience.

### 3.1.8 Auditing

Auditing the procedures that are designed to control or assure that the processes and functions of the Parts Standardization Program are conducted in a prescribed and systematic manner is essential to the Program. A Parts Standardization Program can not be effective if the functions are not being carried out in accordance with established standardization procedure or if the procedures do not reflect the current standardization process. The Board must assure that auditing of the procedures are being conducted, results reported, corrective action responsibilities assigned and corrective action carried out. It is dependent on the implementing company to decide who will perform these audits. It is not important who performs the subject audits, but that they are performed at a high level to assure that the integrity of the Program is maintained.

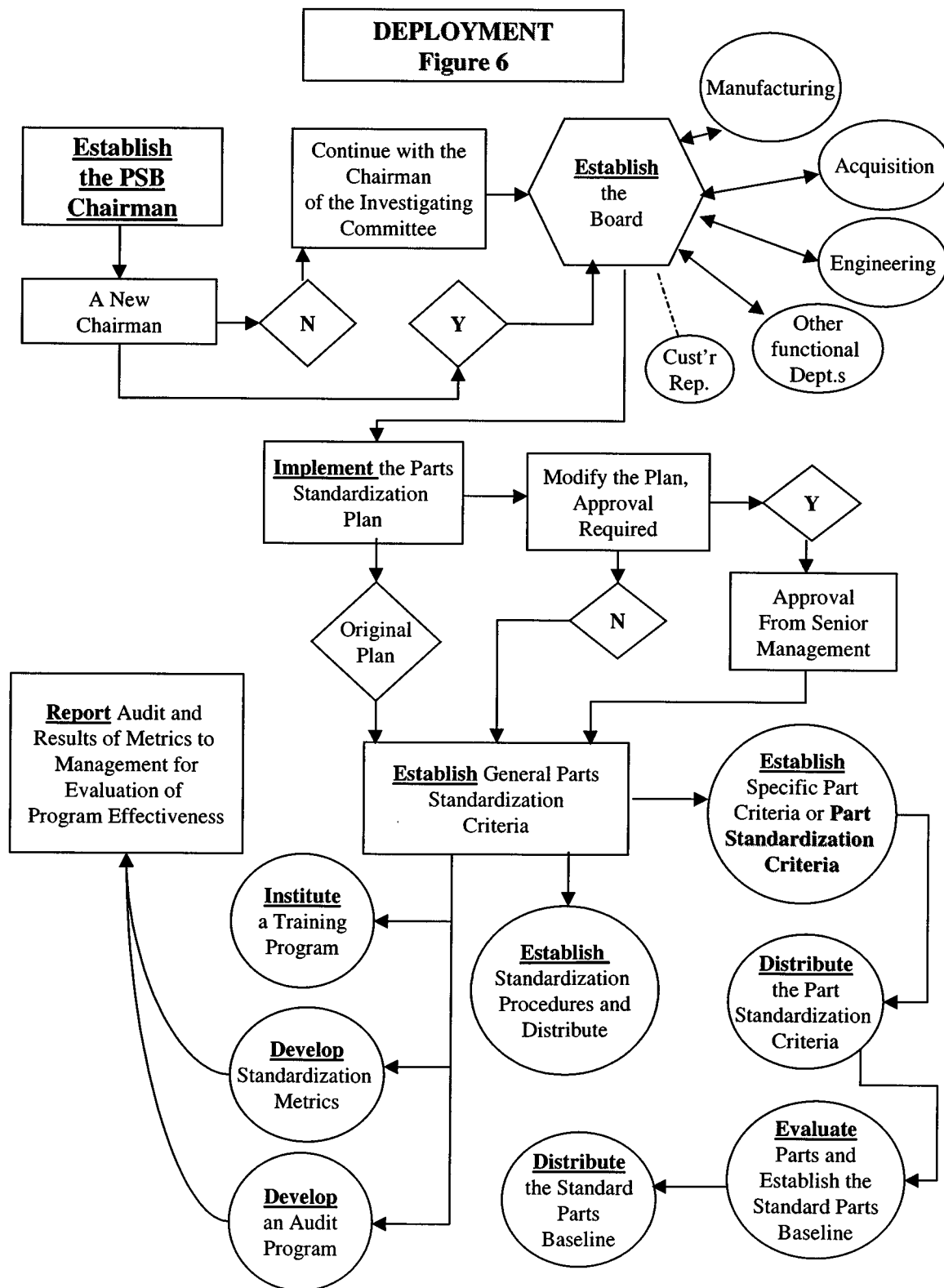
### 3.1.9 Quantification of the Parts Standardization Program Effectiveness

The Parts Standardization Board must be able to assess the performance and effectiveness of the Parts Standardization Program. The original premise for establishing a Parts Standardization Program and the basis for senior management approval was to save the company money. (The qualifications of “saving the company money” are listed in Phase I) Therefore, the Parts Standardization Board must develop the processes and procedures (metrics) in which the effectiveness of the Program can be quantified. The Parts Standardization Board will, as a minimum, report their Program assessment, to senior management and if necessary throughout the company. Further, the Parts Standardization Board should be using the results of their assessment to manage the Parts Standardization Program’s resources with regard to material and manpower in light of company business plan changes.

Phase II, paragraph 4.2.11 are examples of the performance indicators or metrics that could be employed by the Board to quantify the Parts Standardization Program effectiveness.

See figure 6, which is a general depiction of the deployment process.

# PHASE III DEPLOY METHODOLOGY



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